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Original Articles

EMBRYONAL CARCINOMA PRIMARY IN THE MANDIBLE OF A CHILD WITH INVOLVEMENT OF TOOTH PULP

CHARLES M. CAMPELIA, D.M.D., AND PAUL E. BOYLE, D.M.D.
BOSTON, MASS.

THE following report concerns a malignant tumor which involved the mandible and tooth pulp of a 9-year-old child. Malignant tumors in young patients, although infrequent, are not extremely rare. Farber[1] reviewed all admissions of patients up to the age of 12 years at the Infants' and Children's Hospitals during the ten-year period ending in 1939. The total number was 50,164 infants and children exclusive of those admitted to the private wards. He found that histologically verified malignant tumors occurred in 0.6 per cent of these admissions.

The present tumor is reported because of its unusual histologic appearance. It is of special dental interest because of its relation to the dentition.

The material to be described consisted of three surgical specimens which were received in the Department of Pathology of the Children's Hospital, as follows: a preoperative biopsy, the left mandible, and a postoperative biopsy.

PREOPERATIVE BIOPSY

A 9-year-old white boy was admitted to the Children's Hospital where physical examination revealed a hard, tender swelling of the left lower jaw, measuring externally about 5 by 8 cm. The mandibular left second permanent molar had erupted prematurely. Posterior to it there was a large ulcerating mass involving the gingiva and extending into the cheek. This mass prevented occlusion of the teeth. The patient's mother stated that seven weeks previously a small swelling of the lower left gingiva near the last molar tooth was noted and that it increased in size rapidly. The biopsy was taken from the intraoral tumor mass.

Histopathology.—Microscopically the tissue was composed of islands of closely packed cells separated by strands of connective tissue stroma. The typical tumor cell (Fig. 1) consisted of a round or oval nucleus surrounded by scant cytoplasm. The nuclei were vesicular and contained one or two prominent nucleoli. Two types of giant cells were present in small numbers. One of these had an acidophilic cytoplasm and contained an irregular nucleus with coarse chromatin particles and several nucleoli of varying sizes. The other type of giant cell had a basophilic cytoplasm and a large hyperchromic nucleus. Mitotic figures were numerous among the typical small tumor cells.

From the Departments of Stomatology and Pathology, Children's Hospital, and the Laboratory of Oral Pathology, Harvard School of Dental Medicine.

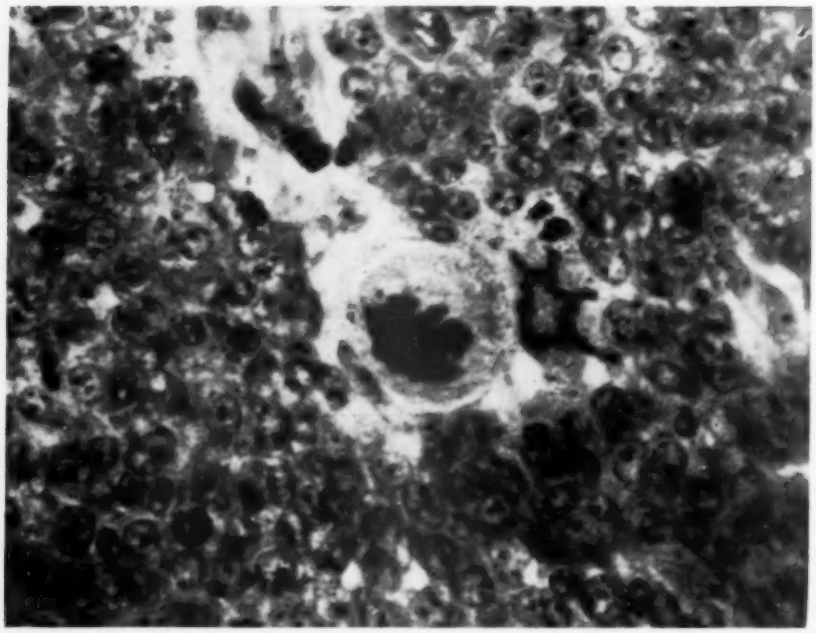

Fig. 1.—Section of the preoperative biopsy showing a field composed of cells with scant cytoplasm and vesicular nuclei with prominent nucleoli. Some of these cells are in mitotic division. In the center of the field are two tumor giant cells which show multipolar mitotic division. (×740).

Fig. 2.—Drawing of an area where the tumor cells were in contact with normal oral epithelium. The normal epithelial cells project into the mid-part of the lower central area. The tumor cells vary greatly in size and are not separated by definite cell boundaries. The arrangement of the tumor cells in islands outlined by collagen fibers is characteristic of epithelium. (About ×700.)

In certain areas the normal epithelium of the oral cavity overlaid the cells of the tumor. Fig. 2 is a drawing of such an area. In the lower center a projection of normal epithelium is shown; meeting it near the center is a mass of tumor cells extending from the upper left border of the field. The character of the cells, the variation in size of the nuclei, and the separation of groups of cells by collagen fiber strands are well shown. One of the tumor cells is in mitotic division. The tumor cells vary greatly in size. No definite cell boundaries or epithelial bridges such as characterize normal epithelium are seen. Nevertheless,

Fig. 3.

Fig. 4.

Fig. 3.—Lateral view of the resected mandible showing the extent of the tumor masses.
Fig. 4.—Medial view of the resected mandible showing the extent of the tumor masses.

the separation of the tumor cells into islands outlined by collagen fibers is indicative of an epithelial arrangement. The tissue was fairly vascular but the centers of some islands of tissue were necrotic. A diagnosis of embryonal carcinoma was made by the department of pathology of the hospital.

LEFT MANDIBLE

A diagnosis of a malignant tumor having been established, a hemiresection of the mandible was performed by Dr. Thomas H. Lanman. The tumor (Figs. 3 and 4) was of firm consistency and dark gray in color. The cut surface was white and glistening. The body and ramus of the mandible were involved with masses of tumor tissue extending from the region of the second deciduous molar to within 2½ cm. of the head of the condyloid process, and on the medial surface, to within 1½ cm. of the apex of the coronoid process. The largest mass

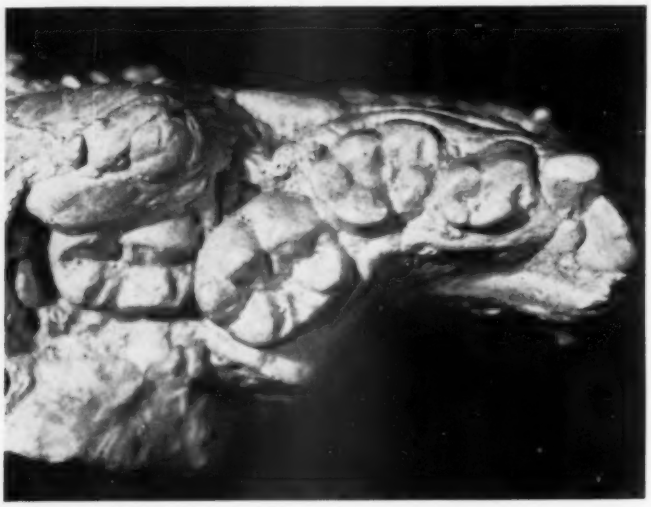

Fig. 5.—Occlusal view of a stone model of the teeth showing the prematurely erupted second permanent molar, the lingually displaced first permanent molar, and the rotated deciduous molars.

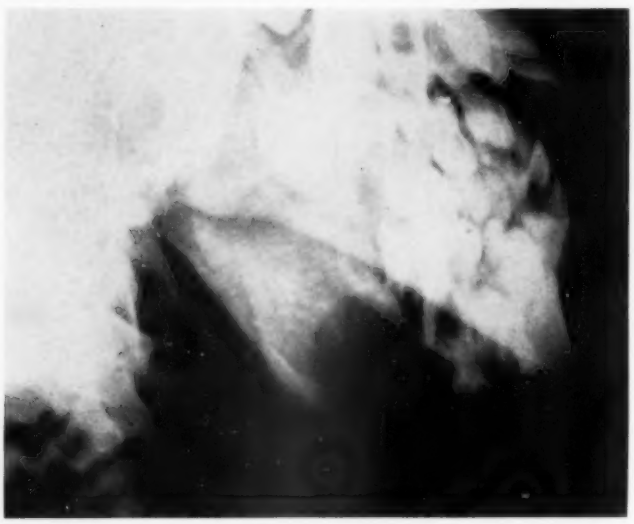

Fig. 6.—X-ray showing osteolytic area and involvement of the teeth.

was located on the medial surface. This mass was continuous with masses on the inferior and lateral surfaces. The lateral mass extended above the occlusal surface of the second permanent molar. This tooth had erupted and was in linguo-

version (Fig. 5). The first permanent molar was in linguoversion and torsoversion. The first and second deciduous molars were also in torsoversion.

X-Ray Examination.—The preoperative x-ray film (Fig. 6) showed a large osteolytic area inferior to the permanent first molar, and extending toward the ramus of the mandible. The bone proliferation demonstrable in the x-ray of the resected specimen was not observed.

Fig. 7.—X-ray picture of the resected mandible showing the sunray effect at the inferior border, fracture, and marked radiolucency in the region of the third molar.

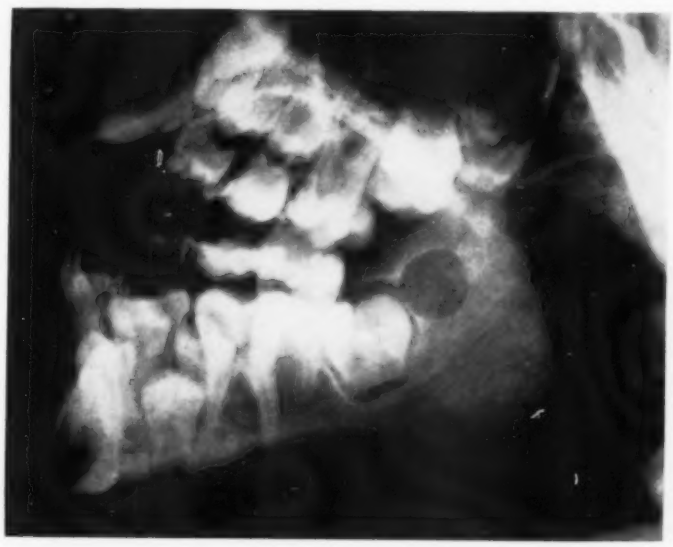

Fig. 8.—X-ray picture showing the presence of a third molar crypt on the unaffected side of the mandible.

X-ray examination (Fig. 7) of the gross specimen showed a fracture near the junction of the body and the ramus of the mandible. A proliferation of bone simulating a sunray effect at the inferior border, much like that seen commonly in osteogenic sarcoma, was visible. In the region of the third molar there was an area of marked radiolucency, while a normal third molar crypt was present on the unaffected side of the jaw (Fig. 8). The teeth showed no x-ray evidence of caries.

Histopathology.—Microscopic examination of a small portion of the gross specimen revealed cells similar to those seen in the biopsy section. Additional findings were invasion of blood vessels (Figs. 9 and 10) and muscle, and many areas of hemorrhage and necrosis. The pathologic diagnosis was embyonal carcinoma with invasion of muscle.

Fig. 9.—Section taken from the resected mandible showing the presence of tumor masses in two blood vessels. (×66)

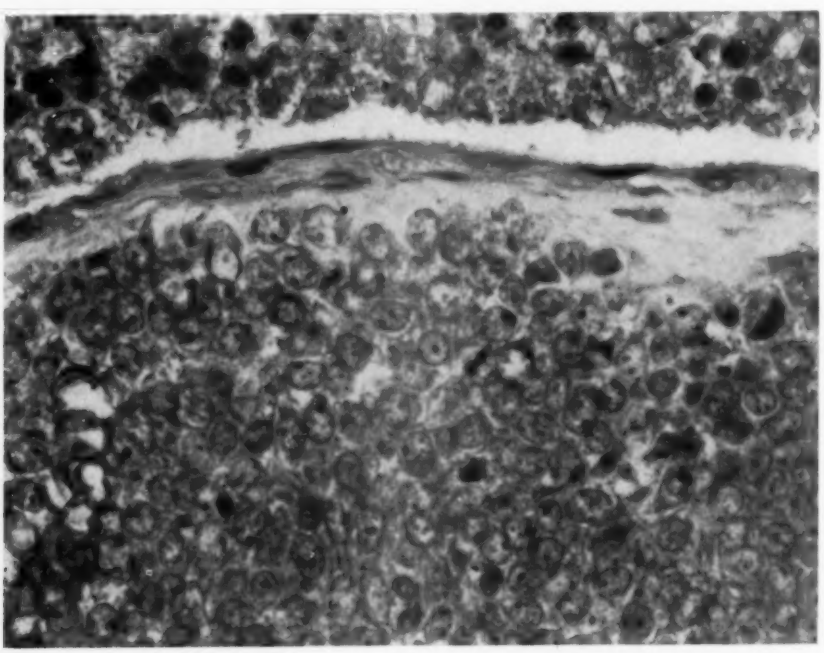

Fig. 10.—Higher magnification of an area of Fig. 9 showing, from top to bottom, intravascular tumor cells, blood vessel wall, and extravascular tumor cells. (×700)

Frontal sections through the mandible and teeth were taken in regions of the first, second, and third permanent molars. These showed invasion of the mylohyoid muscle by tumor cells. The periosteum was thickened and beneath it there was proliferation of bone in radiating spicules. Bone destruction with the invasion of marrow spaces by tumor cells was more marked on the lingual side. Relatively few osteoclasts were present. In the third molar region there was a large area of necrosis. Destruction of the bone in this area was almost complete, only the inferior border of the mandible and scattered spicules remained (Fig. 11).

Fig. 11.

Fig. 12.

Fig. 11.—Frontal section through the third molar region showing extensive destruction of bone with a large area of necrosis and only the inferior border of the mandible remaining. (×2.3)

Fig. 12.—Frontal section through the first permanent molar region showing a mass of secondary dentine on the lingual dentine wall in relation to the involved lingual periodontal membrane. (×2.3)

On the lingual dentine wall of the first permanent molar (Fig. 12) was a large mass of secondary dentine. Involvement of the periodontal membrane was marked on the lingual side. The blood vessels of the pulp were congested and the odontoblastic layer of cells showed vacuolization. At the apex of the tooth there were apposition of secondary cementum and resorption of cementum and dentine. Just below the gingival crevice on the buccal surface, fibrous tissue was seen growing from the periodontal membrane into irregularly resorbed areas on the surface of the dentine.

In the region of the second permanent molar (Fig. 13) there was complete destruction of the lingual plate of bone. The prematurely erupted tooth showed distortion of the developing root. There was evidence of inclusion of blood vessels communicating with the periodontal membrane surrounded by this cellular secondary cementum. The buccal portion of the root showed an apparent duplication of the apex formed by osteocementum detached from the tooth (Fig. 15).

The pulp of the second permanent molar (Figs. 14 and 16) contained tumor masses which differed from those outside of the tooth. There was a tendency toward greater differentiation of the tumor cells in the pulp and the arrangement of these cells into imperfect glandlike structures. The cells were in general much larger, and the nuclei were irregular in shape and markedly hyperchromatic. Some of the cells had a granular cytoplasm and others contained large vacuoles. Mitotic figures were less frequent.

Fig. 13.—Frontal section through the second permanent molar region showing the prematurely erupted tooth with complete absence of bony support. Radiating spicules of subperiosteal bone are also illustrated. (×2.3)

The odontoblastic layer in the apical half of the pulp chamber was reduced to flat cells lying against the dentine wall, or in some areas to complete degeneration with absence of predentine. The pulp also showed marked congestion of blood vessels. Acute inflammatory cells were present in the periapical region, and in a few areas of the pulp. One of these areas was situated close to the dentine wall and was adjacent to a layer of secondary dentine, the formation of which might have been stimulated by the adjacent inflammatory reaction.

Fig. 14.—Frontal section through the second permanent molar showing the arrangement of tumor masses into imperfect glandlike structures in the pulp. (×8)

Fig. 15.—Higher magnification of an area of Fig. 14 showing duplication of the root apex formed by detached osteocementum. (×90)

There was no bony support about the tooth, and there was much necrosis of tissue on the lingual side. The epithelial attachment was destroyed and necrotic tissue extended along the tooth root to its apex. The inflammatory cell infiltration in the pulp was thus explained.

POSTOPERATIVE BIOPSY

Two months and three weeks after resection of the jaw, the patient was readmitted to the hospital because of local recurrence of the tumor. On examination it was found that there was a large purplish swelling somewhat fluctuant centrally in the region of the left lower jaw. Within the mouth in the left posterior region there was an area of gray sloughing tissue which was removed for biopsy examination.

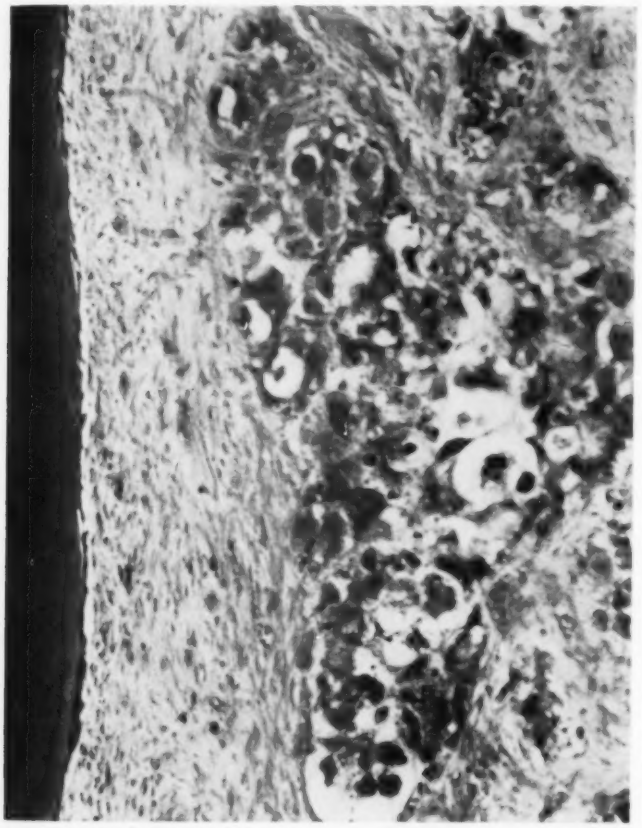

Fig. 16.—Higher magnification of an area of Fig. 14 showing granular and vacuolated cells of the tumor in the pulp and degeneration of the odontoblastic layer. (×140)

Histopathology.—Microscopic examination of the biopsy material revealed an abscess wall of fibrous tissue, numerous polymorphonuclear leucocytes, necrotic cells, and sheets of tumor cells similar to those seen in the previous specimens. The diagnosis was embryonal carcinoma with infection.

One week following discharge from the hospital, the tumor was reported to be rapidly increasing in size. The patient was then referred to a local physician, since the only possible treatment was the administration of opiates.

DISCUSSION

The term, embryonal carcinoma, used in describing this tumor indicates that it is a malignant epithelial tumor of undifferentiated character, with cells resembling those found in embryonic epithelia. We are unaware of a jaw tumor with a similar histologic appearance having been reported in the literature, except for one reported by Aisenberg.[2] He briefly described a malignant epithelial tumor of the mandible in a 9-year-old child. The diagnosis of a malignant epithelial tumor was suggested on the basis of its histologic resemblance to the tumor which we are describing.

The neoplasm might have originated either from embryonic cell rests which are abundant in the region of the face, or from odontogenic epithelial remnants which are found both in the periodontal membrane and in the marrow spaces of alveolar bone. Due to the extensiveness of the tumor, it could not be determined whether the growth originated centrally or peripherally. Considering that the first sign was a swelling of the gingiva near the last molar tooth and that the greatest destruction was in the region of the third molar, odontogenic origin is suggested.

Of special interest to the dentist is the fact that there were early signs which might have suggested the possibility of a neoplasm. First, there was a swelling of the gingiva near teeth which were free of caries or any other visible lesion. Second, there was unilateral premature eruption of the second permanent molar. This tooth erupted due to destruction of alveolar bone and pressure of the underlying tumor, the latter causing distortion of the developing root. Third, lingual malposition and rotation of teeth were caused by destruction of lingual alveolar bone.

The presence of tumor cells in the tooth pulp was an interesting incidental finding. The tumor in the pulp might have been primary or secondary. Primary involvement of the pulp could have been due to the growth of epithelial rests which Orban[3] found to be present in the pulp. Since serial sections were not available it could not be determined whether the spread was due to direct extension or to metastasis of the tumor cells. The latter seems more likely in view of the fact that the tumor cells in the pulp differed greatly from those outside of the tooth. Whatever the direction or method of spread, it was favored by the large apical foramen of the developing tooth.

In reviewing the literature concerning tumor masses in the tooth pulp, it was found necessary to distinguish between true tumor masses and pulp hypertrophy or polypus. The latter is seen in young teeth with large carious pulp exposures and consists of hyperplastic tissue with mononuclear inflammatory infiltration and sometimes an external covering of stratified epithelium. Wedl,[4] in 1870, and Bodecker,[5] in 1894, described excessive growths of exposed pulp tissue in carious teeth. Wedl termed a proliferation of parenchymatous connective tissue a "sarcoma" covering the remains of the pulp. Bodecker reported an epitheliated "lymphomyeloma" of the pulp which he believed resembled but was not identical with granuloma. From the description of these growths it appears that pulp hypertrophies rather than true neoplasms involving the tooth pulp were the subject of these reports.

Latham[6] in 1904 reported what appears to be the first case on record of true tumor involvement of the pulp. His patient complained of neuralgic pain and sensitiveness of a maxillary permanent canine which had a peculiar greenish discoloration. Microscopic examination of the pulp revealed the presence of medullary masses with an epithelial arrangement typical of carcinoma.

That the presence of tumor cells in the tooth pulp is not a rare occurrence is apparent from a report by Zajewloschin and Libin.[7] Upon histologic investigation of the teeth in 56 cases of tumors of the jaw, they found tumor masses in the pulp in 17 cases, 14 of which were carcinomas and 3 of which were sarcomas. They stated that tumor cells were present not only at the apex but deep in the pulp and that in one case of lymphosarcoma in a child the pulps of deciduous and permanent teeth were filled "right up to the ramifications of the coronal portion of the pulp chamber." They did not mention any difference in the degree of differentiation between cells within and cells outside of the pulp. They noted, however, a frequent finding of calcium deposits in the pulps of teeth associated with tumors. They considered this to be the result of an upset in calcium metabolism caused possibly by chemical influences of the tumor cells. Our finding of secondary dentine on the lingual dentine wall of the first permanent molar could be explained by chemical stimulation of odontoblasts by tumor cells lying on the lingual side of the root, but a more likely explanation is the pressure of the tumor against the displaced tooth with the consequent stimulation of dentine formation.

Thuringer[8] described a mixed tumor which involved the tooth pulp and periodontium of a dog. It consisted of metaplastic tissue with the formation of hair follicles and hair. No difference was noted between the character of the tumor in the pulp and that in the periodontal membrane and marrow spaces. The extramandibular portions of the tumor were, however, less well differentiated.

Thoma[9] in 1938 reported an epidermoid carcinoma of the mandible which penetrated into an accessory root canal of a third molar which showed hard tissue changes similar to those observed by us. He also found secondary cementum, resembling osteocementum, with spicules detached from the tooth.

SUMMARY

1. Pathologic findings are reported in a case of a malignant, undifferentiated, epithelial tumor, primary in the mandible of a child. No other jaw tumor with this histologic appearance could be found in the literature.

2. The tumor might have originated from the oral, odontogenic epithelium.

3. The tumor mass caused accelerated eruption and malposition of teeth.

4. Involvement of the tooth pulp and evidence of a higher degree of differentiation of the tumor in the pulp were observed. The literature concerning the finding of neoplastic tissue in the pulp is reviewed.

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MAXILLOFACIAL PROSTHESIS

RAYMOND J. NAGLE, D.M.D., BOSTON, MASS.

MAXILLOFACIAL prosthesis has, because of the war, become one of the outstanding responsibilities of the dental profession. We have facing us the terrible possibility of numerous casualties about the face and neck, not only of the Armed Forces returning from our far-extending battle fronts but also civilian casualties as a result of bombings from the air or other sources—nothing seems too remote for us to expect. Let us hope that our fears are never realized, but if that day does come, we in dentistry will be prepared to do our part to help rehabilitate those who will need our services and experience.

This subject is a broad one and must be divided into three groups or classifications:

1. Those cases which can be treated from within the oral cavity.
2. Those cases which can be treated both from within and outside the oral cavity.
3. Those cases which are treated entirely outside the oral cavity.

Of these three classifications, I will, in this paper, speak only of those which come within the first classification because it is this group which in my opinion is the responsibility of every dentist. Those cases falling into classifications two and three are the responsibility, I feel, of specialists in the field of prosthesis and surgery. Type 1 includes all those cases which can be treated from within the oral cavity; it includes any condition which varies from the usual dental procedures, either a deviation of the maxillary or mandibular form or relation, deformities which are associated with destruction of the soft and hard structures of the jaws, which result in distortion due to muscular dysfunction and atrophy because of disuse. It comprises also distortion occurring as a result of contractile and scar tissue. This last condition presents quite a problem in many cases of maxillofacial prosthesis.

The cause of these deformities is, in most instances, trauma or disease. Under the traumatic type are included accidents of any kind, as well as gunshot wounds as may be encountered during war. Under disease are classified those cases resulting from infections of both hard and soft structures, including syphilis and tuberculosis, and malignant growths. The latter are responsible for the largest number of deformities in this group.

The first or traumatic group responds to corrective treatment much faster and is easier to take care of, as a rule, than the others, because the patient is usually in better physical condition. Patients of the second group are usually fully recovered when treatment is attempted, but there are factors which must be taken into consideration because of necessity they limit treatment. For example, patients having deformities as a result of a malignancy have a predisposition to cell proliferation and on account of this all possibilities of irri-

From the Harvard School of Dental Medicine.

tation must be avoided and surfaces which in a case of traumatic deformity would be used to accept a load, are of necessity relieved or avoided. This may result in a less stable appliance.

Corrective treatment, while it must be started as early as possible to prevent further deformity from tissue change or malposition of parts from muscular pull, should be delayed until the patient is completely well. This is necessary for several reasons, the outstanding of which is that the patient is more cooperative and lends great assistance by his own control; also in well patients the mucous membranes and adjacent structures are of a firm resilient nature. In patients who are not well the structures lack good tone and as a result do not readily accept an appliance as complicated as many of these corrective appliances have to be.

EXAMINATION AND DIAGNOSIS

The final success in maxillofacial prosthesis is dependent upon an accurate history, careful local examination, and diagnosis. A history both past and present, going into a detailed collection of all facts which even in the slightest way may have an effect upon the ultimate success of the treatment, is essential. Local examination of the teeth and investing structures must be carried out to the most minute degree of detail. With the assistance of x-ray films each existing tooth should be investigated, first as an individual unit and later as a part of the oral mechanism. Existing restorations must be investigated carefully and vitality tests should be made on every tooth so there will be no question regarding these teeth after the corrective appliance is inserted. Local examination must include all structures involved in the deformity, including scar tissues, as well as normal tissues. All scars, especially those in adjacent structures, such as the lips and cheeks, should be x-rayed for the presence of foreign bodies, regardless of the medical report.

It is not uncommon to find foreign bodies in the lip and cheek scars which prevent the part from returning to normal. If the x-ray reveals the presence of a sizable foreign body, it should be surgically removed before treatment is started. I do not feel, however, that minute particles in healed tissues should be removed. I have observed a number of cases over a long period of time in which small foreign bodies were retained and no complications have arisen. My reason for avoiding surgery whenever possible, once healing is complete, is because the exploratory surgery necessary for removal of small particles results in a disfigurement usually much greater than the one being treated.

Diagnosis and treatment planning for maxillofacial prosthesis are a step which requires a great amount of study. Before any treatment is contemplated, study casts made from accurate impressions must be assembled and if possible mounted on an articulator for detailed study. Photographs of the patient, both front and profile, assist greatly in studying facial harmony. I cannot overemphasize the importance of correct diagnosis in these cases, because patients with these defects are so dependent upon what we do for them that their future comfort and outlook on life are in our hands. Ultimate success is dependent upon the application and judgment of the basic principles of all phases of prosthesis. We must realize, however, that it is necessary to recog-

nize the type and magnitude of the deformity, and to realize that these conditions require a compromise treatment. The objective in each case is to obtain the best possible result.

TREATMENT

A discussion of the treatment of these deformities to be comprehensive must of necessity be divided into several parts.

1. Treatment of deformities of the dentulous or partially dentulous maxilla and adjacent structures.
2. Treatment of deformities of the dentulous or partially dentulous mandible and adjacent structures.
3. Treatment of deformities of the edentulous maxilla and adjacent structures.
4. Treatment of deformities of the edentulous mandible and adjacent structures.

Before going too far into the treatment procedures of these cases may I point out that treatment is not alone a problem of prosthesis. It includes all phases of operative dentistry, and a considerable amount of orthodontics besides prosthetic dentistry. It is the operative phase I wish to discuss first because I feel very strongly on this part of the treatment. I have repeatedly seen appliances fail because no attention was given to operative measures before the prosthesis was started. In the first place, every tooth should be retained regardless of its position, provided it is sound clinically, and every effort should be made from an operative viewpoint to make it sound. My reason for retaining teeth is because appliances which have the advantage of natural teeth for support are far superior to those which do not have this support. Besides a tooth retained at this time, though not needed for support of the first appliance, may be a very valuable anchorage ten or more years later.

The restoration of damaged teeth must receive careful consideration. Regardless of the assets in favor of amalgam, restorations made of this material do not stand up well under prosthetic appliances; therefore in my opinion the teeth of these patients should be restored if possible by gold inlays, which allows the replacement of lost contours and contact points wherever possible. Patients who have lost part of the oral structures, whether they are teeth, bone, or the soft tissues of the cheeks, lips, or muscles of mastication, have also a loss of function which results in an impairment of the self-cleansing mechanism of the teeth resulting from the natural function of mastication. This increases the susceptibility to caries as can be easily demonstrated in this type of patient with very few exceptions. Recognition of this fact should guide us in the restoration of their mouths. All restorations of individual teeth should be well extended and the teeth to be used as abutments should, in those cases which indicate a high susceptibility to caries and require a broad coverage for retention of an appliance, be protected by cast full veneer crowns. If this principle is not observed decalcification and caries will destroy the abutment teeth within a year, and in a very short time thereafter failure of the appliance will follow, to say nothing of the loss of valuable tooth structure so important to these patients.

Perforation of the Hard Palate.—This condition, a common deformity of the maxilla, may exist in any part of the palate. Treatment is quite simple provided teeth are present which can be used for retention. If the perforation is small, extension into the cavity should be avoided, but in some of the larger perforations extension to the floor of the nasal cavity is more comfortable for the patient. Impressions for these cases may be taken with the hydrocolloid materials; the use of plastic materials with a hard set should be avoided, because of the danger of traping. Modeling compound is not an accurate material for impressions of this type.

Larger Maxillary Deformities.—Deformities of the maxilla involving larger areas, which may include a portion of the palate such as complete loss of teeth

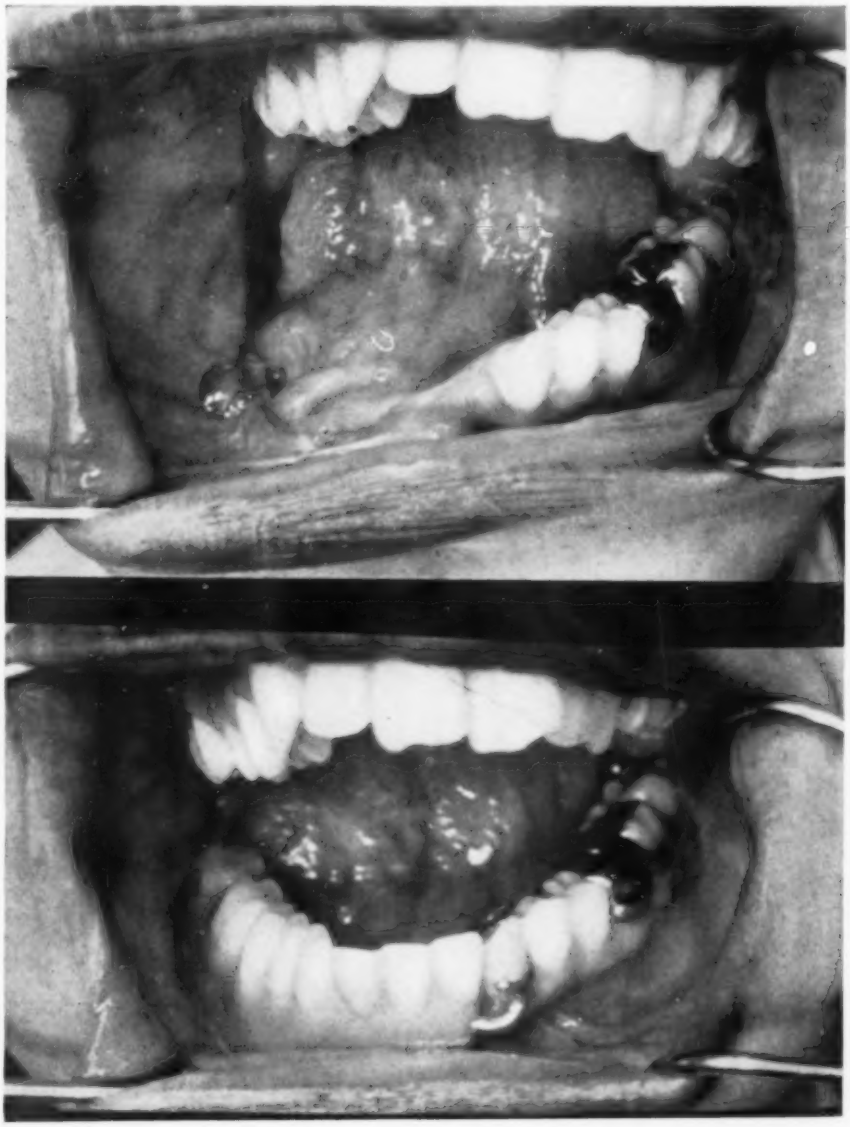

Fig. 1.—*A*, Complete loss of the body of the right mandible. *B*, Appliance in place restoring occlusion and facial contour. The lingual surfaces of the remaining teeth were used for stability of the appliance.

in one segment and involving the maxillary or nasal cavities, require a much more detailed approach because in these cases we are treating not only an intraoral condition but also an extraoral deformity. The latter is caused by a loss of facial support formerly supplied by the underlying hard structures to the features and muscles of expression. The problem then is one of restoring not only intraoral function, but also extraoral function, and esthetics. Restoration by prosthesis, once all operative measures have been treated, is not too difficult or perhaps I should say not as difficult as one would suppose upon first observation. The procedure is as follows: First an impression of the remaining teeth and hard structure is made, using a hydrocolloid impression material, because they are by far the best materials for taking impressions of these cases. From the impression a cast is made, mounted on a parallelometer, and surveyed for retention. This parallelometer is the same as is used for surveying any partial denture. This step is of primary importance to the success of the case. Hit-or-miss design, proceeding by the so-called observation method, is not sufficient and will in many cases introduce an error at the start which may of

Fig. 2.—Injury resulting in mandibular fracture, severe lip deformity, and impairment of occlusion.

itself be responsible for failure. Following the design a casting is made, which after necessary adjustments may be used as a base for building the remaining part of the appliance. This building is done by using modeling compound and wax, until the missing parts are filled in, and the desired facial contours restored. Paraffin wax to which 5 per cent vaseline has been added is very useful for the final adaptation of this phase of the impression. The necessary relations of the mandible to the maxilla are now taken. The cast made from this impression may be used to construct the finished appliance.

If there is any amount of scar tissue present which causes a contractile deformity of the face, maximum stretching should be avoided in the first appliance as it will act as a dislodging force which may unseat the restoration

during function. Stretching is accomplished over a long period of time by a gradual filling out, and by increasing the fullness of the appliance. This stretching, depending to a large extent upon the severity of the deformity, may take from a few months to a few years. Perseverance on the part of the operator as well as of the patient is almost as important a part of the treatment as the actual construction. A complete explanation of these problems should be given the patient before the treatment is started.

Fig. 3.—Orthodontic treatment supplemented by fixed prosthesis to increase vertical dimension over a period of a year has restored a satisfactory occlusion.

Fig. 4.—Stretching has eliminated deformity caused by scar tissue.

Mandibular Deformities.—Treatment procedures for dentulous mandibular deformities are fundamentally the same except that there is frequent necessity for some type of orthodontic measures to correct displacement. Loss of mandibular bone frequently results in malposition of remaining parts because of muscle pull. Deformities due to malposition are very simply overcome by orthodontic treatment before the corrective appliance is made. In many cases of traumatic injury—and this applies to maxillary as well as mandibular cases—fractured large segments of bone, which may include teeth, may become reattached in poor position, causing a malocclusion which seriously complicates the

case. Orthodontic correction of the malocclusion to restore the occlusion to as near a normal level as possible should be completed, and before prosthesis is started.

Maxillofacial Prosthesis.—For the edentulous patient maxillofacial prostheses are in many instances a real problem because of the questionable factors of retention. We cannot hope for the ideal result in these cases, yet we must adhere strictly to the fundamentals of complete denture construction if we hope to arrive at a satisfactory result.

Maxillary deformities which present loss of part of the hard palate or include a perforation into the maxillary sinus are very nicely corrected by the usual method employed in treating ordinary cases. One should not attempt to fill or make plugs for small perforations; it is not necessary for retention.

For cases which present a loss of large portions of the maxillary bones involving facial deformity, a compromise treatment is necessary. A preliminary impression should be taken in modeling compound making certain it is not allowed to harden in the bony cavity. This impression should include all exposed surfaces which in the opinion of the operator can be used for denture support. By this I mean it should extend into cavities which are deep enough to afford an area for retention, but only if lined by a satisfactory membrane for surface contact. Such cavities often afford valuable aid in retention of the appliance. I cannot, however, overemphasize the importance of caution when entering any open bony cavity which may be undercut if the material being used has a hard set.

Fig. 5.—An accident resulted in a severe deformity of the lower portion of this girl's face, especially the lower lip and chin. Building of facial contour has been done with several complete dentures over a period of three years.

From the preliminary impression a vulcanite tray is made upon which an occlusal rim is attached. This rim is occluded with a similar one on the mandible and the facial contour or tissue stretching done before the final impression is taken. For the final impression material paraffin wax is used to which 5 per cent vaseline has been added to lower the flow temperature. The zinc

oxide impression pastes may be used, but I avoid them because of the difficulty of removal if there are any bony protuberances. From this point on, the procedure for finishing the appliance is no different from that for any edentulous treatment.

Mandibular deformities often present a real problem of retention. If large sections of the mandible are lost, the bulk of the original impression is best taken with a high-fusing modeling compound, in either the regular trays or one specially shaped to meet the needs of the operator; final surface adaptation is accomplished by means of a low-heat compound or paraffin wax. This impression should include as much area on the remaining mandibular stump as possible and should extend into tissue pockets to restore the facial contour. It is surprising how much retention is gained by extension into tissue pockets, either normally present or surgically prepared for the express purpose of aiding retention. For those mandibular deformities which have the base of the mandible present but show considerable vertical loss of mandibular bone and often produce facial disharmony necessitating tissue building or stretching, retention must of necessity be aided by the use of one of the gum tragacanth powders. Continued use, however, may not be necessary because once the stretching of the tissues has been completed a considerable factor of displacement is eliminated. Also, since this usually takes quite a period of time the patient learns how to control the appliance surprisingly well.

Occlusion in these cases is an important factor to final success; all lateral and dislodging forces must be eliminated for tissue comfort as well as stability. For these reasons the choice of the cuspless posterior teeth is essential. They should be built to a balance as nearly perfect as the case will permit.

There are many other types and forms of deformities needing corrective prosthesis which I have not attempted to cover. Treatment of these would be fundamentally the same as for those I have described which are the most common ones. I feel I can safely say that the clinical procedures in maxillofacial prosthesis as treated from within the oral cavity are not much more difficult than prosthesis for normal cases provided the elements of sound diagnosis, prognosis, and clinical procedure, as well as the functional and esthetic requirements, are understood and applied.

358 Commonwealth Avenue

FISSURAL CYSTS

BALDWIN SAYER, D.M.D., AND JOSEPH B. SCULLY, D.M.D.
CHELSEA, MASS.

THE differentiation of the various types of cysts of the jaw is an important step preliminary to treatment. Some cysts may be distinctly typed as being odontogenic in origin, such as the follicular cyst forming from the tooth follicle, and the radicular cyst forming from a dental granuloma containing epithelium. Larger cysts are not as easily classified, because in such an advanced stage their origin is not readily determined. We shall attempt, by a review of the literature and by presentation of some clinical cases, to differentiate some of the more common cysts of the facial clefts or fissures.

ETIOLOGY

Nonodontogenic cysts of the jaws may form from enclaved epithelial cells where the embryonic processes forming the face unite. The fissures or clefts most frequently involved are the nasoalveolar cleft, the globulomaxillary cleft, and the palatal cleft.

Nasoalveolar Cysts.—Cysts of the nasoalveolar cleft form at the junction of the globular, lateral, nasal, and maxillary processes. The cyst is firmly attached to the bone at the wing of the nose where it may be lying in a depression caused by pressure atrophy. It will be most often found, however, that the greater part of the cyst encroaches on the nasal cavity, causing a bulging inside the nostril, and extends also into the vestibule of the oral cavity. The swelling is fluctuant and may become so marked that the patient presents a decided asymmetry of the nose and face. Because this cyst is not a central lesion, roentgen findings are of no aid in diagnosis.

Palatal Cysts.—Several types of cyst form on the palate. Cysts of the papilla palatina and the incisive canal are the most commonly known. Neither of these, however, are true fissural cysts as they are formed from the nasopalatine duct, either in the incisive foramen, or in the incisive canal, and not, as are the true fissural cysts, formed from the enclaved epithelium at the junction of the palatal processes.

The Globulomaxillary Cyst.—This is a true fissural cyst. It forms at the junction of the globular and maxillary processes and, therefore, may occur bilaterally, or on one side only. That there may be a hereditary tendency is a good possibility. These cysts have in the past been mistaken for radicular cysts, because when large, they may grow around the apices of the adjoining teeth. While periodontal cysts may form between the roots of any of the teeth, globulomaxillary cysts occur only between the lateral incisor and the cuspid. Here, where the premaxilla joins the maxilla, is the place that cyst formation is most common, and when the cyst occurs between perfectly normal teeth, there is no doubt that in many cases it originates from epithelium enclaved in the fissure. This is the same place which contains the alveolar cleft when a cleft palate extends to the lip.

From the Soldiers' Home, Chelsea.

Globulomaxillary cysts, therefore, form in the alveolar process between the roots of the lateral incisor and cuspid. The first result of its presence is a diversion of the roots of these teeth. Later, the cyst may extend into the maxilla and occasionally it may expand laterally and involve neighboring teeth. Confusion exists sometimes in differentiating this type of cyst from a radicular cyst formed from an apical granuloma on the lateral and central incisors. In these cases, we do not find the area dipping down between the lateral incisor and cuspid causing divergence of the roots.

The first clinical symptoms of a globulomaxillary cyst are the changed position of the lateral incisor and cuspid. Later there may be a bulging of the alveolar plate at the labial surface of the maxilla, often associated with obscure sensation of pressure.

Diagnosis of a globulomaxillary cyst, therefore, depends to a great extent on careful clinical examination and x-ray investigation. It is differentiated from a radicular cyst because the latter does not dip down between the roots of the lateral incisor and cuspid. The adjoining teeth may not be involved, and therefore surgical inroads should be made with the idea of saving these teeth if they are not involved.

Pathologic examination shows, as a rule, a very thick and dense cyst wall. Sometimes the epithelium forms deep projections into the underlying tissue. When irritation, or infection, has set in, a chronic inflammatory reaction is visualized by marked round-cell infiltration.

The Median Palatal Cyst.—This is also a true fissural cyst. In the alveolar process the median fissure is often visible in roentgenographs of the anterior maxilla in children. Cysts may develop there if epithelial rests from the globular processes become enclaved. This development occurs between the roots of the central incisors. This is differentiated from a radicular cyst because it does not involve the apex of the tooth, and teeth may be normal in every way. It must be further differentiated from an incisive canal cyst which is located more posteriorly in the median line and is round or heart-shaped rather than laterally compressed or oval. Even though the teeth have been lost, it can still be recognized by its location in the alveolar process and its oval shape. Median cysts grow to a much larger size and give typical symptoms even when small. The most common results are diastema between the central incisors and a slanting of these teeth toward the median line, both conditions being due to the exertion of pressure of the expanding cyst on the roots of the teeth. Bulging of the palatal surface anterior to the papilla palatina occurs in larger cysts, and especially in edentulous jaws.

Median palatal cysts may also occur posterior to the incisive foramen at the junction of the two maxillary palatine processes. Here they generally develop in circular fashion producing a symmetrical swelling on the hard palate. They may also cause an elevation of the floor of the nasal cavity.

X-ray examination in these cases helps greatly in arriving at the correct diagnosis. The incisive canal cyst and the posterior median cyst are best seen in the occlusal film taken in an almost vertical direction, while the alveolar median cyst is shown to best advantage in a regular dental film of the alveolar portion of the bone.

CASE REPORTS

CASE 1.—Mr. A. W. C., who was being admitted for the surgical removal of hemorrhoids, presented himself at the dental clinic, as a routine procedure of the hospital before operation. The history is of no great importance other than that upon questioning it was learned that he occasionally experienced a slight pressure sensation in the maxillary right canine area. It was never very severe, and he never thought of doing anything about it.

Examination.—Very poor mouth hygiene was evident, most lower teeth were present; considerable calculus was found, and decay. Only canine to canine was left of the maxillary teeth. Periodontoclasia was present. The two centrals and right lateral incisors were considerably decayed, though the pulp was not exposed. Crowns of the canine and lateral incisors on the right side were slightly inclined toward each other. A fistulous opening was found on the alveolar gingiva between the two teeth. The area was tender on palpation with some purulent discharge from the fistula.

X-ray Examination.—An area was evident between the two teeth, involving the lateral more than the canine and extending incisally between the two teeth. A diagnosis of radicular cyst of the right lateral incisor was made, and it was decided to remove the remaining maxillary teeth (Fig. 1*A* and *B*).

Fig. 1.

Operation.—A vertical mucoperiosteal flap was made in the canine eminence under local anesthesia, the teeth were extracted, and the buccal plate was removed. An encapsulated sac approximately 20 mm. in diameter was removed. It was a thick fibrous sac containing purulent material. The bony crypt was continuous, showing the teeth were not involved. A partial alveolectomy was done. The tissues were approximated and sutured. An iodoform wick was inserted. Healing was slow due to a secondary infection. The wound was irrigated with saline, and the wick was changed daily for two weeks, at which time the incision had completely healed over (Fig. 2).

Diagnosis.—Because of the surgical findings, the diagnosis was changed to globulomaxillary cyst; however, microscopic examination was not made.

CASE 2.—Mr. G. K. came to the clinic requesting that his remaining upper teeth be extracted. A partial denture which he had been wearing was no longer serviceable, and a full denture was desired.

X-ray Examination.—Roentgenograms were taken of the teeth to be extracted as is the practice at the clinic. Upon examination of the x-ray, shown in Fig. 3, it was found that it was not a case of simple extraction. A large cystic area was found on the left lateral incisor, extending some distance superiorly and distally. It appeared to be perforating the alveolus in the canine area, though the lateral incisor was still very firm and showed no clinical evidence of pathology. No canine was present, for they had been removed some years previously. No fistula was present, or any other evidence of disease. There was no history

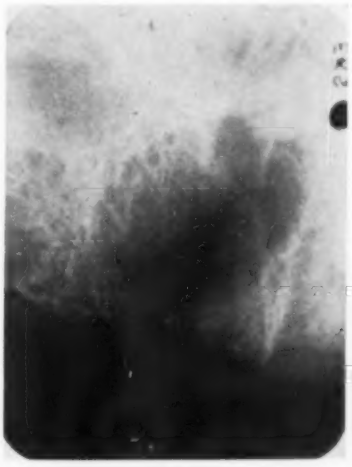

Fig. 2.

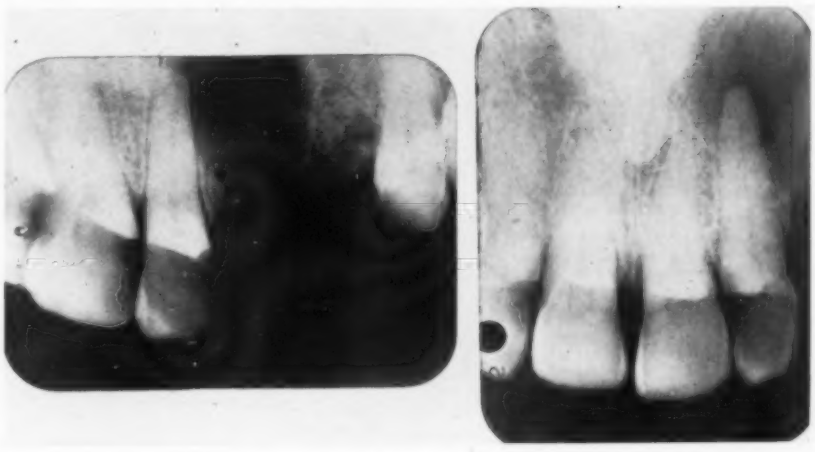

Fig. 3.

of pain or pressure in this area. The individual was totally unaware of this condition. The extraction of the canine had been rather easy, and there were no complications he could recall.

Operation.—Under local anesthesia an incision was made along crest of ridge in the canine area; the interdental papilla was incised. A vertical incision

was made along the axis of the lateral incisor. A mucoperiosteal flap was deflected by blunt dissection. The alveolus was intact, and there was no perforation, although the bone was thin and easily removed. A thick fibrous sac was found. It was adherent to the process and difficult to remove by blunt dissection. It extended palatally and did not involve the lateral incisor. It was fully 30 mm. in diameter and contained a thin mucous fluid. The teeth were extracted, the process trimmed, the tissue approximated and sutured; an iodoform wick was inserted and changed to irrigate with saline solution for two weeks, during which time healing was continuous and without incident.

Diagnosis.—For the want of a microscopic picture the diagnosis in this case is difficult. I would like to call it a globulomaxillary cyst as everything seems to point to it. However, it could be a radicular cyst which continued to grow when left after the extraction of the canine tooth.

Case 3.—Mr. C. A. W. was referred to the dental clinic from the medical department. He was seeking relief from rather vague neurologic pain in the scapular region. He had been under treatment for some time without result.

Examination.—Local examination showed a mouth rather badly neglected—caries throughout, with a considerable amount of calculus. No fistulae were evident, and there were no dental complaints.

Fig. 4.

Fig. 5.

X-ray Examination.—A full mouth intraoral x-ray survey was made. With one exception, the x-rays showed the same condition as the clinical examination, that is, alveolar recession and caries. However, between the maxillary left lateral incisor and cuspid, an area was found. In the incisor picture (Fig. 4) it appears to be localized around the apices of the lateral incisor, though in the canine picture (Fig. 5) it seems to be more between the teeth, and extending incisally. The crowns of the teeth are definitely tipped toward each other with the roots diverging. The lateral crown is badly broken down from the effect of caries.

Diagnosis.—A differential diagnosis of globulomaxillary cyst, or a radicular cyst of the lateral incisor, was difficult. It was decided to remove the lateral incisor because of the condition of the crown and explore through the socket.

Operation.—The lateral incisor was extracted. The apices were found to be involved. Flap was prepared, the buccal plate removed with rongeurs, and a

radicular cyst about 6 or 7 mm. was enucleated. The tissues were sutured. It healed without incident. As yet we have not had a report from the medical department concerning his general condition.

Case 4.—Mr. J. P. B.'s case is an example of nasopalatine or incisive canal cyst.

Examination.—In the first x-ray, taken March 4, 1942, you will note (Fig. 6) the large circular area at the apices of the central incisors. At this time it was decided to put off any dental surgery because of his hypertension.

Fig. 6.

Fig. 7.

On Nov. 11, he again visited the clinic, and another x-ray was taken (Fig. 7). You will note now that the left central incisor seems to be involved. His physical condition had improved so it was decided upon to operate on him.

Operation.—Under local anesthesia, preceded by nembutal gr. 3, a U-shaped flap was made on the palate. The maxillary bone was completely destroyed in the area. There was considerable mucous discharge, and a thin sac was exposed and removed. Upon enucleating the sac it was found that the left central incisor was involved. Another U-shaped flap was made on the buccal side just over the apices of the left central incisor. An apicoectomy was performed and the root canal filled. An iodoform wick was inserted into both the palatal and buccal perforations and changed daily. The healing progressed normally.

Fig. 8.

Fig. 9

Case 5.—This is another palatine cyst which was not truly a fissural cyst. Mr. R. F., who was confined to the hospital with dry gangrene of the right foot, came to the dental clinic one morning early in December complaining he could no longer use his upper denture. Upon examining him it was found he had a large swelling covering his whole palate. With a topical anesthesia of ethyl chloride, an incision was made which allowed a considerable amount of thick purulent material to escape. A wick was inserted and after daily irrigations for ten days, it closed itself and appeared perfectly normal. X-ray at that time was negative of pathology (Fig. 8).

On Jan. 2, he again appeared, this time wearing his denture, though complaining of a feeling of pressure in his palate. There was no external evidence, and no x-ray evidence of disease, as you will note in the second roentgenogram (Fig. 9).

Operation.—A U-shaped incision was made, and a mucoperiosteal flap retracted. An area devoid of bone was found to contain a thin-walled sac. It contained mucous fluid, but no purulent material. After removal of the sac the flap was sutured into place.

Case 6.—Mr. J. LaC. was another patient referred to us from the medical department. He was a healthy looking man about 48, crippled with arthritis in most of his joints. He had sought treatment at the Boston City and Massachusetts General Hospitals finally winding up at the Captain John Adams Hospital.

Fig. 10.

Examination.—A full mouth x-ray showed no evidence of disease other than a radiolucent area in the median line of the maxilla. The central incisors and left lateral incisor were lost five years previously. Since that time he has been wearing a partial denture. When questioned as to the extraction, he said that for about a year and a half he had had a severe intermittent pain with a continuous puffy feeling, and occasional difficulty in breathing through the nose. Also, his front teeth were becoming very "crooked." He went to his own dentist and had the teeth extracted, and for two years had no further trouble. After some period of time, however, the symptoms began to reappear, though not as bad as before. The condition though was progressively becoming worse. In

addition, he was complaining of a disagreeable taste in his mouth due to a discharging 8 mm. palatal papilla.

Diagnosis.—Infected median cyst.

Operation.—A palatal flap was prepared; the incisive canal was widened when a large cyst sac could be removed from the region labial and superior to the canal. Considerable purulent material was evacuated, after which the cavity was partially sutured. A wick inserted for drainage was changed daily, and the area was irrigated for one week. At the time the patient came back for routine check-up, he stated: "Feel like a new man. Arthritis completely gone, no more bad taste in the mouth, and complete freedom from pain and pressure in the lip."

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THERAPY AND PROPHYLAXIS OF DRY SOCKET

B. Gottlieb, M.D., LL.D., D.M.D., and H. M. Crawford, D.D.S.,
Dallas, Texas

DRY socket is a complication in which a part of the alveolar bone is denuded and opens into the mouth cavity. This is a condition which develops in connection with the extraction of teeth. It arises because a part of the alveolar bone fails to become covered by a blood clot and subsequently with connective tissue. It is exposed to the mouth fluids and the action of bacteria. It usually takes at least fourteen days for the connective tissue to sever the denuded bone from the bone of the jaw and to restore the normal condition in which the bone is not exposed. Until that time, the exposed dying bone is irritated by the mouth fluids, which results in pain. Practitioners try to protect that denuded bone against irritation by using different kinds of dressings. We propose to give this bone a natural protection.

Experimental extraction of rat molars, with consecutive histologic examination, revealed dry socket. Fig. 1 shows a part of the alveolar bone protruding denuded into the mouth cavity while it is still connected with the living bone. The epithelium of the mouth attaches to the bone, apparently, at the borderline between the living and the dead bone surface. Nature is probably trying to get rid of the dying part of the alveolus. Fig. 2 shows a higher magnification of the epithelial attachment, but we find no sign of resorption under it; instead, we find apposition of new, not yet calcified bone. Apparently, this newly formed bone retards the further resorption and prolongs the sequestrum formation and thus postpones the healing.

We do not know whether the process in the human mouth is similar, but cases with long protracted healing may point to such an explanation. The following therapy for dry socket has been successfully used in a number of cases. It is as follows:

Under anesthesia, the necrotic debris is removed and the field is syringed with a watery iodine solution (Lugol's) and aspirated. This syringing and aspirating is repeated several times, after which the soft tissue is peeled back from the bone as far as possible. The denuded bone, including part of the adjoining healthy bone, is chiseled off and all sharp edges are removed. The soft tissue is then replaced over the remaining bone. Occasionally, it is necessary to suture, using only one suture in order to hold the mucosa in place. The pain ceases instantly, and the wound heals very quickly. During this operation it is important that no gauze sponges should be used. We feel that their use is thoroughly contraindicated since they tend to push debris and bacteria into the marrow spaces of the remaining bone.

The prevention of dry socket can be accomplished by using, principally, a surgical technique of tooth extraction. It is important not to damage the soft gingival tissue, because we need it to cover the wound after the extraction. For

From the Department of Oral Pathology and Dental Research, Baylor University College of Dentistry, Dallas, Texas.

that reason, we make a clean and well-defined incision, and peel back the gingiva from the bone as the first step of the operation. The flap is designed with proper regard for its blood supply, using incisions both bucally and lingually on both sides of the tooth to be extracted. A small surgical chisel is then inserted between the tooth and bone, using the mallet, and proceeding around the tooth until the entire root is loosened in its socket. It then can be removed easily and the alveolar margins—which are going to be resorbed anyway—are removed with

Fig. 1.—(*a*) A piece of alveolar bone protruding into the mouth cavity (*b*). At (*c*) the bone is necrotic. At (*d*) an abscess has formed. (*e*) Connection with the other alveolar bone. (*f*) Epithelial attachment to the bone.

the chisel, care being taken not to leave any sharp edges of bone. After aspirating the blood from the base of the socket, we replace the gingival flap over the opening of the socket. Since this has reduced the alveolar bones, the flaps are able to cover the whole bone wound, and uneventful healing is the result.

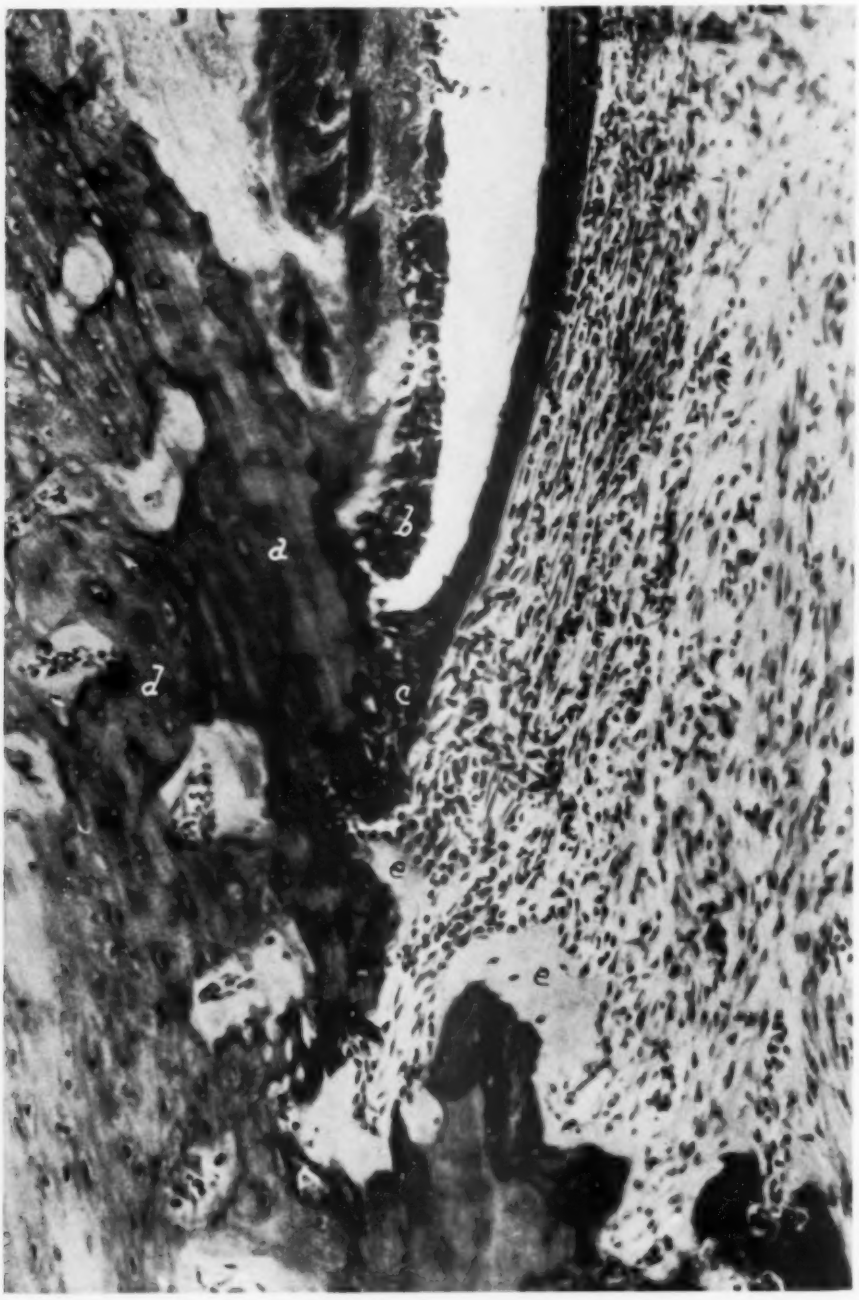

Fig. 2.—From Fig. 1 area "f" under higher magnification. (*a*) The less necrotic part of the extruded bone, partly with empty bone lacunae. (*b*) Necrotic material in the "pocket." (*c*) Attachment of the mouth epithelium to the bone. (*d*) Living bone with cells in the lacunae. (*e*) New bone deposition, delaying resorption.

In the removal of multirooted teeth we are more and more using the tooth division technique as the method of choice. We feel that this method conserves the osseous structure and minimizes trauma. It also reduces the pumping of bacteria from the gingival crevice into the capillary system. It prevents root fractures in a great many cases, and also facilitates the easy removal of roots with infected apices, so that they are not scraped and thrust against the sides of the alveolus, thereby forcing infection further up into the bone than it has already traveled. After the flaps are reflected, the teeth are divided with either the impactor, or discs or burs. Then we proceed to remove each of the roots as was described for the single-rooted teeth.

ODONTOMA

MEYER L. ROSOFF, D.D.S., NEW YORK, N. Y.

THE general interest in odontomas has found expression in numerous contributions to dental, oral surgical and pathologic literature since the latter part of the nineteenth century when these tumors were first defined and classified.[3] Continental and English authors have been most particularly active in these studies,[3, 5, 8, 10] which possibly have not received as much attention from American sources as they appear to deserve.[1, 2, 4, 6, 9]

The clinical setting of these tumors is quite variable and not infrequently is obscure when secondary factors and complications predominate. Diagnostic problems are important in odontoma not only because of the possibility of mistaking it for other tumors but also for dystrophic or other lesions of bone. Roentgenographic features, although generally well-defined, are not pathognomonic and may be confusing. The treatment is usually relatively clearly indicated but must be guided by special conditions and findings which require careful evaluation in individual cases. The pathology of odontoma is of fundamental importance in the classification and analysis of the lesion as well as in its diagnosis because of the peculiar relationship of these tumors to odontogenic cysts, adamantoblastoma, and to other mesodermal and epithelial odontogenic neoplasms of benign and malignant types.[3, 5, 9]

In view of these considerations and the fact that in spite of the numerous publications the actual number of cases available for study and reference is small, it seemed that the present case might be of interest because it illustrates several features of significance with respect to the clinical setting, diagnosis, surgical problems, and pathology of odontoma.

REPORT OF A CASE

History and Findings.—A. S., a white male 48 years of age, a cab driver, of good physical condition, presented himself with the complaint of slight pain and tenderness in the lower left cuspid and premolar region. Clinical extraoral examination was negative. The intraoral examination of the region disclosed no evidence of pathosis excepting some tenderness in the above-mentioned region.

Radiographic examination revealed a considerable mass of what appeared to be calcific particles in the lower left lateral incisor, cuspid, first premolar regions. The lower left cuspid itself was seen to be impacted, lying with its crown in a distal direction and facing the mesial root of the lower left first molar (Fig. 1).

Operation.—Under conduction anesthesia two incisions were made, one extending downward to the mucobuccal fold over the labial of the lower left central, and the other over the center of the buccal of the lower left second premolar. Both incisions were connected at the ridge.

The mucoperiosteal tissue was then reflected and the bone amply exposed. Except for some bulging of the external plate, no sign of the existing under-

lying condition was evident. When some of the bone, eggshell in consistence, was removed, the presence of a membrane filled with hard substances was disclosed.

The lower left lateral incisor and first premolar were then removed and the membrane with its contents was enucleated. The total number of the enucleated calcific particles was about 30. Some of these were found to be individually imbedded in bone at some distance from the tumor (Fig. 2).

Because it was deemed advisable to remove the lower left impacted cuspid at some future time, the tissue was brought back into position and retained with sutures. The wound healed uneventfully. The pathologist's report was as follows:

Fig. 1.

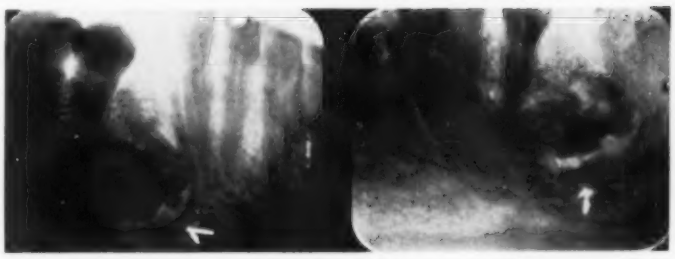

Fig. 2.—Particles embedded in bone outside of membrane.

Gross.—The specimen consists of an irregular mass and fragments of hard tissue from the region of the left mandibular cuspid. The mass is 1.7 by 1.8 by 0.7 cm. It is composed of grayish brown soft tissue and interspersed grayish and opaque white calcific particles of irregular size and shape. The other

hard fragments are of similar gross appearance and measure approximately 2.0 cm. in diameter. Individual particles vary from 0.4 to 0.5 cm. in length and 0.3 to 0.5 cm. in diameter (see x-ray of excised tissue, Fig. 3).

Microscopic.—The mass is composed of rudimentary teeth, particles of dentine, cementum, and amorphous calcific material in a matrix of fibrillar and fibrous connective tissue (Figs. 6, 7, 8, and 9). There are a few islands of polyhedral and squamous cells scattered in various areas (Figs. 8 and 9). They are arranged in concentric whorls and elongated strands. Basal layers are well defined and the cells are homogeneous. The dental structures are irregularly formed and in some portions are only particulate (Figs. 5, 6, and 7). Areas of this type also manifest irregular calcification. This is evident in the ground substance, the fibrous matrix, and in occasional epithelial islands as irregular

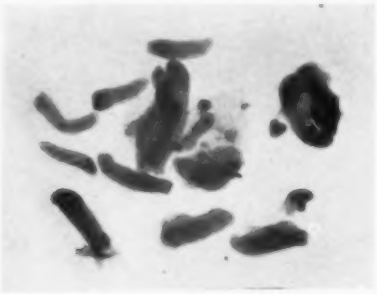

Fig. 3.—Radiogram of tumor contents.

calcospherites. The fusiform cells of the matrix are homogeneous but are variable in distribution. Some areas of compact connective tissue are relatively acellular. Pulp tissue is present in the canals of a few of the rudimentary teeth and the larger particles of dentine (Fig. 6). It is associated with deposits of dentinoid in a few areas. Fibrohyalinization and moderate reticular atrophy are evident focally.

Diagnosis: Composite compound odontoma with odontogenic epithelium in a quiescent phase.

CLASSIFICATION

There is a recent tendency[4, 6, 9] to utilize the best features of previous classifications[3, 5, 8] in a histogenetic and pathologic grouping of tumors of odontogenic type as of epithelial, mesenchymal, or mixed varieties. Odontomas may originate in any of these tissue combinations and are further grouped depending on their pathologic structure as enameloma from epithelium; odontogenic fibroma or fibrosarcoma, dentinoma, cementoblastoma from mesenchyme; and fibroadamantoblastoma, adamantinosarcoma, composite odontoma (of geminated, compound, complex, or cystic varieties), and odontoadamantoblastoma from combinations of ectodermal and mesodermal tissues. The accepted nomenclature in American literature confines the term odontoma to the tumors of mesodermal, and combined ectodermal and mesodermal structure, and considers odontogenic cysts and adamantinoma (ameloblastoma, adamantoblastoma) as related but separate entities.[4, 6, 9] The present author is in accord with these views.

INCIDENCE

The incidence of odontoma varies considerably according to various compilations, but all reports indicate that it is a rare tumor in its fully established form.[8] In a survey of material from the department of pathology at the New York University College of Dentistry extending over ten years and including 1,800 specimens, Darlington and Lefkowitz found 15 odontomas. Two were of immature type.[4] Geschickter reported 5 odontomas in 323 cases of tumors of

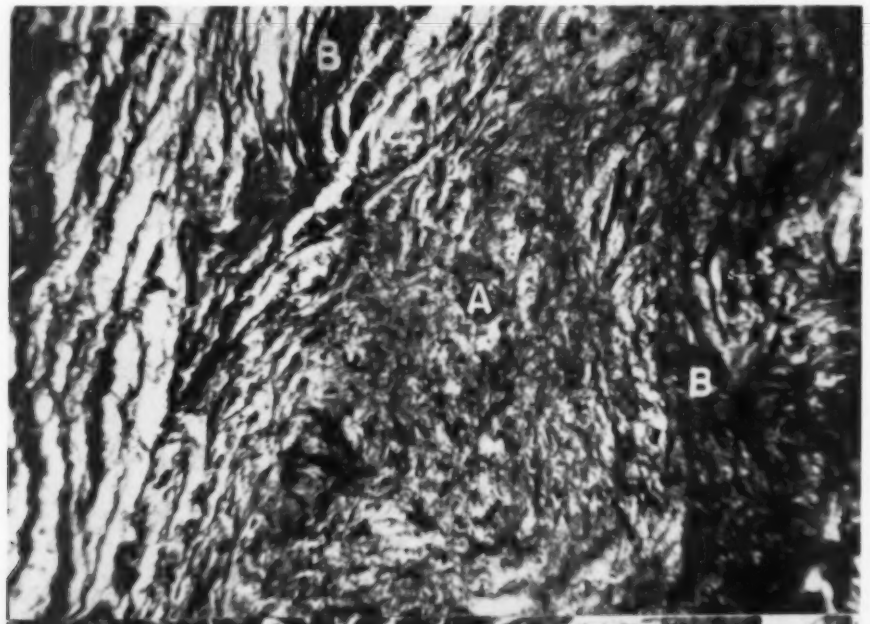

Fig. 4.

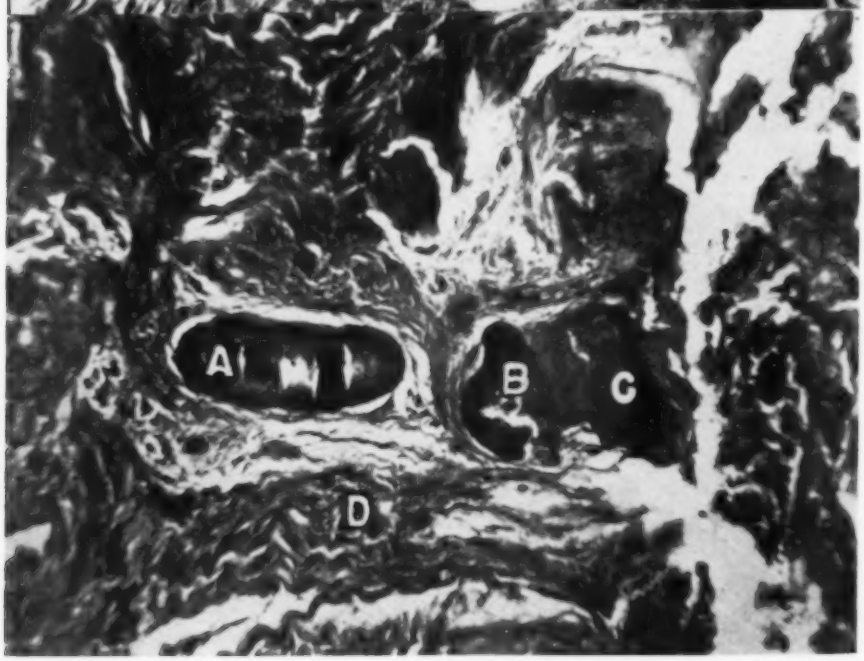

Fig. 5.

Fig. 4.—Fibrous tissue area in odontoma (×160). *A*, Delicate fibrillar zone. *B*, Compact fibrous trabeculae.

Fig. 5.—Rudimentary dental calcific particles in fibrous tissue (×160). *A*, Amorphous calcific particle of osteocementum. *B*, Particle of osteocementum fused with an irregular block of bone.

the jaws from the laboratory at Johns Hopkins.[6] Gettinger studied 18 cases of odontoma at the New York Institute of Clinical Oral Pathology and found 8 cases of compound, 6 of complex, 2 of geminated composite type, and 2 of mature fibrous type. This represented the incidence in over 2,000 accessions.[7]

CLINICAL FEATURES

The tumors occur with equal frequency in both sexes and in all races.[8] There is a predominance of males in the series of composite complex odontomas

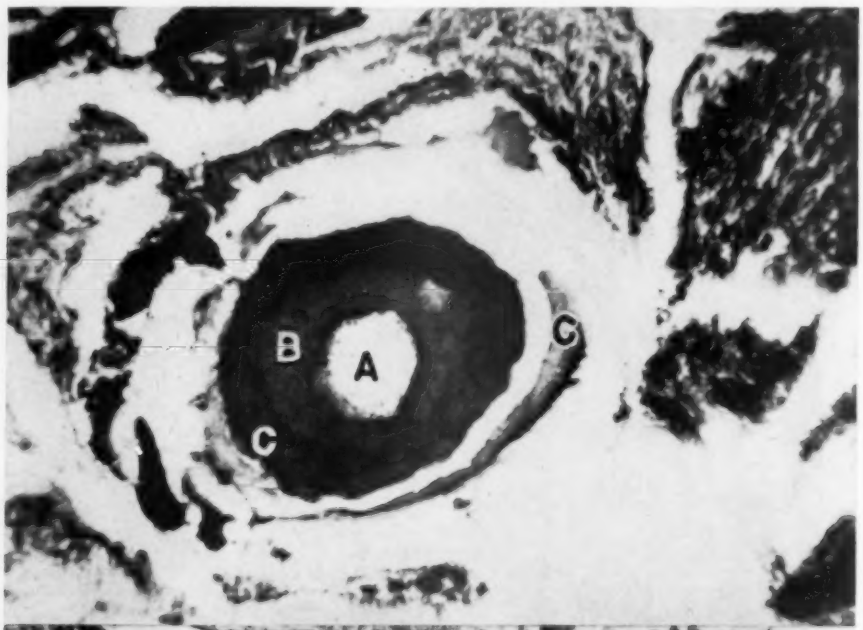

Fig. 6.

Fig. 7.

Fig. 6.—Rudimentary tooth (×160). *A*, Canal with pulp remnants. *B*, Dentine. *C*, Irregular deposits of cementum.

Fig. 7.—Rudimentary tooth (×96). *A*, Irregular canal. *B*, Dentine. *C*, Irregular deposits of cementum.

of Gabell, James, and Payne.[5] Their cases of composite, compound type occurred equally in both sexes. Age incidence ranges from 5 months to 60 years. The second and third decades have a larger case incidence than all others combined.[8]

Location of odontomas varies with different types. Although most forms of composite complex tumors are found in the mandible and occur in the molar regions, the composite compound types occur most frequently in the maxilla,

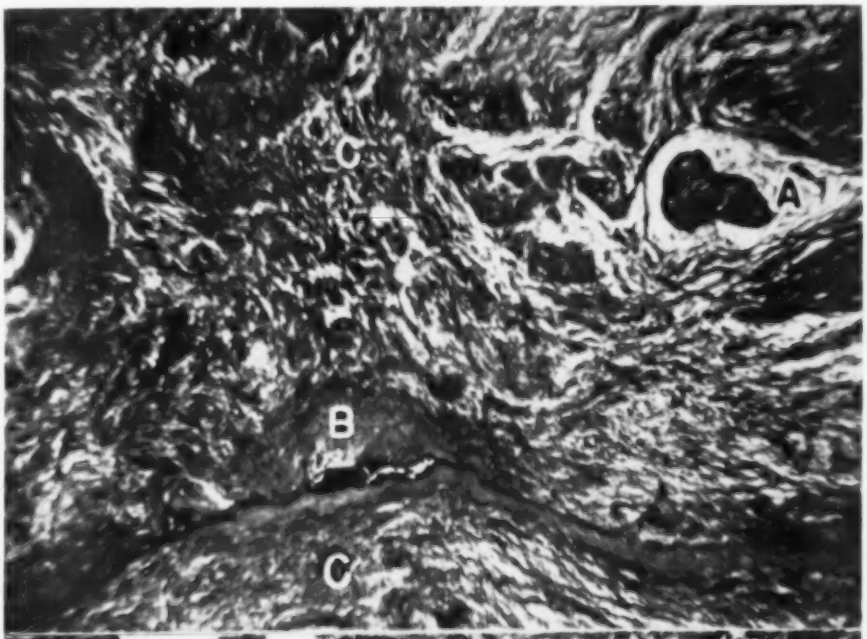

Fig. 8.

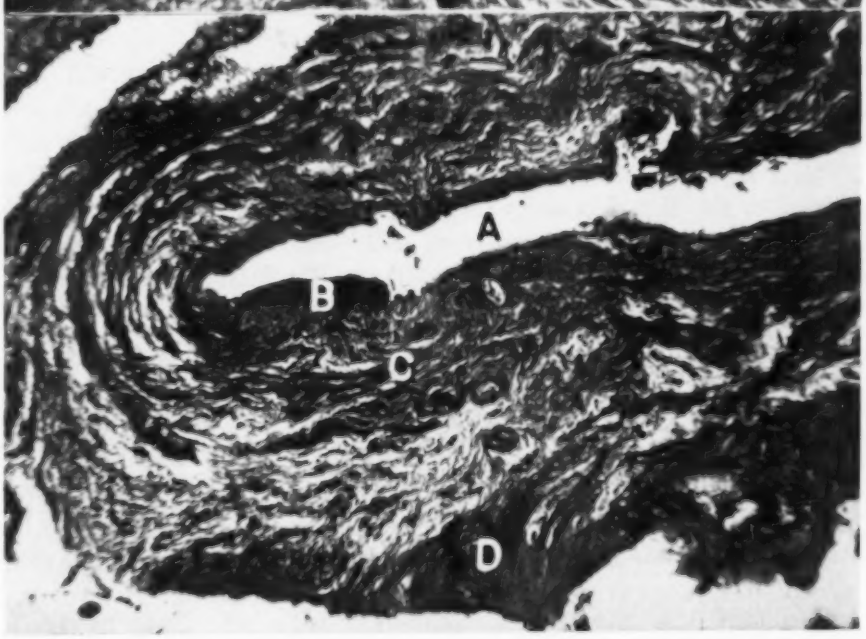

Fig. 9.

Fig. 8.—Compressed and hyalinized follicular sac remnant with an adjacent island of odontogenic epithelium (×96). *A*, Odontogenic epithelium in a quiescent phase. *B*, Hyalinized collapsed follicular sac with hemorrhage. *C*, Fibrous tissue stroma.

Fig. 9.—Follicular sac remnant (×96). *A*, Compressed sac cavity. *B*, Residual plaque of quiescent odontogenic epithelium. *C*, Fibrous tissue wall. *D*, Dense fibro-hyaline margin.

anterior to the premolars. Geminated forms most often involve the incisors and canines.[5, 8, 9]

Clinical setting also differs with various types of odontoma as noted in the characteristic histories reported by Blum,[1] Gabell, James, and Payne,[5] Nagel,[8] and Thoma.[9] Some cases are asymptomatic and remain so for many years. A frequent history is that of a slowly growing mass. Occasionally the patient is unaware of facial asymmetry that is apparent to others. As the tumor increases in size there is pressure on adjacent structures with complaints of uneasiness, tenderness and neuralgic, or bone, pain. Portions of the tumor may erupt and be mistaken for sequestra. Confusion with abscess, osteomyelitis, and osteitis was frequent before the use of the roentgenogram, and it was not unusual for cases to be treated with incision, drainage, and débridement for considerable periods until the diagnosis became evident.[5, 6, 8, 9] Smaller tumors as noted at the present time produce less striking changes. But they interfere with the structure and function of the dental arches in sufficient degree to arouse clinical attention. This is owing to modern concern with orthodontic, periodontal, and prophylactic dentistry.

Physical findings depend on the location, size, and type of the tumor. The tendency of composite complex odontomas to become established before the second dentition may be a factor in the production of relatively early signs through interference with the form or the eruption of adjacent teeth as well as those directly implicated.[5] Occasionally, however, tumefaction may not be of sufficient degree to produce symptoms until the area is edentulous and there is some interference with a prosthetic appliance.[1] The expanding tumor usually extends one portion of the ridge or the buccal or lingual plates to the point of obvious swelling that is clinically ascertainable. In early stages the tumor is defined by the intact cortex and has a uniform, smooth, or slightly nodular surface over which the bone and mucoperiosteum are adapted. The absence of one or more teeth from the involved portion of the arch is frequent and should arouse suspicion as to the nature of the lesion. The bony hard consistence of the complex and compound odontomas is characteristic, but this may also be evident in fibrous tumors still encased by the expanded, thin but intact cortex. The tough, rubbery quality of the latter group becomes apparent when the compact layer is eroded.[5, 6, 9]

Roentgenographic findings are characteristic for those composite compound, dilated, geminated or gestant tumors in which radiopaque shadows of rudimentary or malformed dental structures are recognizable.[1, 2, 10] The less differentiated complex type of tumor presents irregularly shaped, radiopaque masses in a matrix of varying density from which they are imperfectly separable.[9]

Treatment planning must be determined by the size, shape, position, and structure of the tumor as noted on physical and roentgenographic examination. The accepted treatment of odontoma is surgical excision. However, it must be remembered that there is a considerable range of lesions in this category and that they have a wide variety of clinical settings which must, in the final analysis, guide the course of action. Various aspects of these special problems have been discussed by Blum,[12] Gabell et al.,[5] and Thoma.[9]

PATHOLOGY

Odontomas are a heterogeneous group in which mesodermal and epithelial elements are in combination in various proportions and arrangements to form tumors in which dental histioid and organoid features are evident. Classification depends on the differentiation of the tissue structure and arrangement. The pathogenesis of the group has been attributed and in some instances been traced to aberrations in the follicle, the papilla, the enamel organ and the dental lamina during the course of development.[3, 5, 8, 9] Splitting, budding, fusion and adenomatous epithelial proliferation are factors which could affect the blastema and produce the disturbed relationships and disorganization of dental tissue noted. Epithelial elements are present in many of these tumors. They are remnants of odontogenic epithelium from the follicle or its precursors.

Composite compound odontoma represents a more organoid and differentiated type of growth in which dental structures approaching normal architecture and relationship of tissue elements are formed. The size, shape, and external gross features of the compound tumor resemble those of the complex type except that the capsule is more likely to be penetrated by an erupting rudimentary or malformed tooth and to be fused with an unerupted or impacted tooth. Size range is from a few millimeters to several centimeters in diameter with an average more nearly 3 to 6 cm. The rounded ovoid mass is encapsulated. Surfaces are uneven or lobulated and encapsulated by surrounding fibrous tissue under which nodules project. On section the tumor contains calcific particles imbedded in a stroma of fibrous connective tissue of varying consistence which most frequently is dense, firm, and resilient but occasionally is calcific. The number of rudimentary or malformed teeth in the mass varies from two or three up to several hundred, and averages more nearly twenty to thirty.[5, 6, 8, 9]

The histologic structure of the organoid elements closely approaches that of the normal tissue types and, not infrequently, is identical with it (Figs. 6 to 9). Enamel, dentine, cementum, pulp, connective tissue and bone are elaborated by specific cellular elements which form organic matrices and characteristic differentiated tissue types. Calcification usually proceeds in the hard tissues along the usual lines of increment. These developments are not always perfectly realized, however, and account for the aberrations of form and structure which are almost invariably present (Figs. 6, 7, 8, 9).[2, 5, 9] In addition to rudimentary or deformed teeth there are irregular masses of enamel, dentine, cementum or bone without definite arrangement or relationship in a stroma of fibrillar or fibrous tissue, osteoid or bone (Figs. 5, 6, 7). Odontogenic epithelium (Figs. 8, 9) occurs as in complex composite tumors.[2] Cell types, arrangements, and distribution are similar. The entire mass may project into or be imbedded in the wall of a cyst lined by odontogenic epithelium.[9]

SUMMARY

The odontomas form a complex group of tumors in which mesodermal and epithelial components of the odontogenic blastoma occur in various combinations.

The structure of the tumors serves as a useful criterion on which the more comprehensive classifications are based.

An illustrative case showing many of the characteristic clinical, roentgenographic, and pathologic features of odontoma is presented.

Treatment planning is of considerable importance, but it must be individualized to meet special problems.

Further reports on odontomas, particularly the rare immature, mixed, locally infiltrative, and the malignant varieties, are indicated to establish a more satisfactory basis for present views with respect to their pathogenesis, response to modern operative procedures, radiosensitivity, and prognosis.

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369 EAST 149TH STREET

Case Report

CASE NO. 81

TUMOR OF MAXILLA

HARRY J. FIELD, D.D.S., AND ALFRED A. ACKERMAN, D.D.S.
NEWARK, N. J.

MRS. R. C., a young housewife, 26 years old, presented herself with a tumor of the left maxilla.

Past History.—At the age of 13 (thirteen years ago) the family of the patient observed a slight prominence of the left side of the face. Consultation with local physicians resulted in the child being sent to a prominent New York hospital for the treatment of tumors. At this institution the condition was diagnosed as chronic osteitis and a series of x-ray treatments were prescribed. During the next four years these x-ray exposures were given at three- to four-week intervals. Periodic radiographic examination of the head was also made. At this time (age 17) she discontinued regular treatment at the hospital, returning about once every two years for observation. All through the years the slight prominence continued but did not increase in size. She was married last year and seven weeks ago gave birth to a child. It was upon returning home from the hospital that a new chain of symptoms began.

Present Illness.—The first symptom was a feeling of numbness about the upper posterior teeth with occasional shooting pain in the region. Concerned

Fig. 1.

Fig. 2.

because of her past history of trouble in this region, she returned to the New York hospital for consultation. A new series of radiographs of the head were taken. No radiographic changes were observed (as compared to earlier films). She was informed that the pain was probably due to a slight inflammatory process and was advised to use warm applications on the jaw. When she followed these instructions, the swelling increased markedly and the pain about the teeth became more intense. She sought relief from her family dentist, who seeing a soft fluctuant area in the buccal fold (resembling a localized abscess) stabbed into the area with a straight blade. The tiny incision bled profusely, but no pus was recovered. On the following day the patient was referred to our office.

Fig. 3.

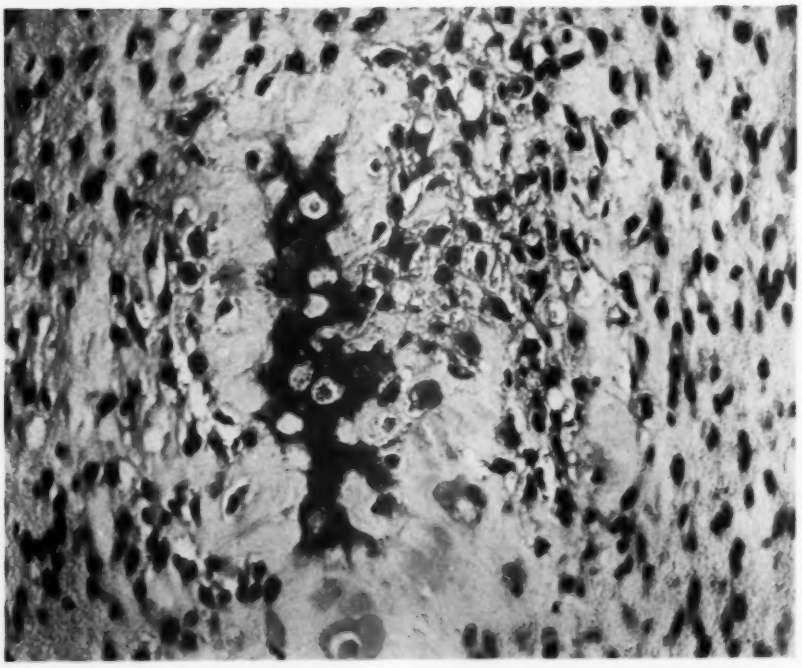

Fig. 4.

Clinical Examination.—The patient was a healthy young woman of normal height and weight. There was a marked prominence of the left cheek, and the skin covering this area was slightly blanched. The swelling was soft and fluctuant but not painful (Figs. 1 and 2).

Intraorally an extensive area of soft, fluctuant tissue extended from the canine to the third molar on the left side. The first molar and second premolar were quite loose.

Roentgen Examination.—Lateral and anteroposterior head plates were taken. The left sinus was completely occluded and the bone showed definite changes in character caused either by the tumor or the x-ray exposures. These changes are especially well shown in the dental films illustrated in Fig. 3.

Operation.—Biopsy tissue was removed by incision through the mucous membrane in the molar region.

Pathologic Examination.—Microscopic examination of the biopsy tissue from the Laboratory of Oral Pathology, Harvard School of Dental Medicine, showed the tissue to be cellular with numerous islands of poorly differentiated bone and cartilage (Fig. 4). There are numerous mitotic figures, some of which are of the multipolar type.

Diagnosis.—Osteogenic sarcoma.

Comment.—In reviewing the history of this case several important observations deserve emphasis. Primarily, activation of tumor growth frequently occurs during pregnancy. This phenomenon is believed to be related to glandular imbalance during this period. Again, the failure to call into consultation the oral surgery service at the hospital is regrettable. It is at least doubtful whether the oral surgery service would have been satisfied with a diagnosis of chronic osteitis of the maxilla in such a case. Certainly intraoral films would have been taken and probably an early biopsy would have been suggested. In the present advanced condition of infiltration, the prognosis is unfavorable. The patient has been returned to the New York hospital where a radical resection was performed. The patient recovered successfully from the surgery and has returned to her home.

130 Market Street

Editorial

The Minimum Standard for Dental Departments in Hospitals

The American College of Surgeons adopted, about the middle of February, 1943, a Minimum Standard for dental departments in hospitals: Thus, they added to the fifteen Minimum Standards for distinct hospital services and departments, which supplement the general Minimum Standard for Hospitals on which the Hospital Standardization program of the American College of Surgeons is based, a sixteenth standard.

The following are the new requirements:

1. *Facilities.* The Dental Department shall be adequately equipped for diagnostic, operative, and laboratory work.

2. *Accommodation.* The Dental Department shall be a complete and self-contained unit located in suitable and adequate quarters.

3. *Organization.* The Dental Department shall be properly organized and under the direction of a Director of Dental Services. In addition, a complete staff of the Dental Department shall embrace Exodontist, Periodontist, Prosthodontist, Dental Surgeon, Dental Consult in Radiology, Dental Intern, and Graduate Nurse.

4. *Professional Personnel.* The professional personnel shall be selected with due care as to character, professional ethics, training, ability, and operative skills. Appointments to the dental staff shall be made by the governing board of the hospital according to predetermined requirements and shall follow the same procedure as that of the medical staff.

5. *Adjunct Personnel.* Adjunct personnel shall be properly selected and essential training in their respective activities.

6. *Training.* Interns and nurses whenever possible shall be given theoretical instruction and practical experience in the care of dental patients.

7. *Treatment.* The Dental Department shall provide for the elimination of oral sepsis by hygiene and/or surgery for inpatients, outpatients, and hospital personnel

— to relieve pain

— to meet the dental needs of the patient:

Oral Surgery	Restorative dentistry
Oral Hygiene	Periodontia

8. *Consultation.* Dental consultation shall be sought

— in all cases involving fracture of the maxilla and mandible

— in all cases where prosthetic restoration may later be required

— in examination and care of the expectant mother's dentition

— in the education of the mother as to the importance and care of the child's primary and secondary dentition.

9. *Conferences.* The dental staff shall attend and participate in the medical staff conferences and shall hold monthly departmental conferences for the thorough review and analysis of their clinical activities. Such other meetings shall be held as will advance the knowledge of each member of the dental staff and improve the professional work of the hospital.

10. *Records.* Accurate and complete dental records shall comprise history, examination, reports of x-ray and laboratory examinations, consultation, diagnosis, treatment, and result.

It is further suggested that in the small hospital in which finances or physical limitations prohibit the immediate establishment of a dental department as outlined, the appointment of a Dental Consultant would be advantageous. Dr. W. Harry Archer, Jr., Chairman of the Committee on Hospital Dental Service of the American College of Dentists, in addition supplied the Editor with the standards proposed for approved Class "A" hospitals by the committee on Community Dental Service of the New York, and Tuberculosis, and Health Association, as well as the subcommittee on Dental Standards and Services in Hospitals and Institutions, of which Malcolm W. Carr, D.D.S., is Chairman, and Waldo H. Mork, Henry C. Slatoff, and Raymond C. Wells are the other members. The following are the proposed regulations:

I. General Considerations

Dentistry is recognized as an important division of health service and consequently adequate dental care of the hospitalized patient becomes a necessary factor in the treatment of many medical and surgical conditions. This interdependence between medicine and dentistry is accepted in hospital organizations and thus the dental service has become a recognized unit of the modern hospital. Since this development is comparatively recent, it is natural that there has been experimentation with several plans of procedure with varying success and satisfaction. Thus, standardization is much needed.

Consideration should be given first to the minimum standard for the hospital dental service and secondly to acceptance and maintenance of a systematic plan of management of the dental service as an integral part of hospital standardization. Two decades of progress toward hospital standardization have been completed and remarkable improvement is recorded through a succession of surveys but there has been no official recognition given to the minimum standards for the dental service. Therefore, in addition to the need for standardization there exists also the desideratum of including minimum standards and an accepted plan of management of the dental service in the requirements of approved Class "A" Hospitals.

II. Minimum Standards for the Hospital Dental Service

In order to receive a Class "A" rating it should be required:

1. That approved hospitals have a Department of Dentistry and that the inclusion of a Department of Dentistry should be recognized as an official requirement in accordance with the generally accepted plan of hospital standardization.

2. That the Department of Dentistry should be separately organized and should function in an autonomous manner as the service equivalent of any specialty of medicine, and that the By-laws of the Hospital should be amended, where appropriate, to include the words "dentist (licensed to practice in the state)" and any other revisions necessary to provide for department status of the dental service. Corresponding revisions in the Rules of the Medical Board should also be made to clarify interdepartmental procedure.

3. That dentists privileged to practice in the hospitals should be organized as a definite group or staff.

4. That membership upon the staff be restricted to dentists who are (a) full graduates in dentistry of acceptable dental schools, in good standing, and legally licensed to practice in their respective states; (b) if special work in oral surgery is undertaken the dentist should be competent in this field and qualified in accordance with minimum standards; (c) that the dentist be worthy in character and in matters of professional ethics and that the practice of division of fees, under any guise whatsoever, be prohibited.

5. That the Director of the Department of Dentistry be a member of the Medical Board of the Hospital.

6. That the Department of Dentistry function in accordance with a systematic plan of management based upon standards of organization and services. (See Section III of this report.)

7. That the equipment and instrumentarium of the Department of Dentistry be adequate for the practice of Dentistry or such branches of Dentistry as may be included in the dental service, in accordance with generally accepted standards of practice and with the systematic plan of management set up hereinafter. Dental x-ray apparatus and pulp testing apparatus is considered a basic requirement of equipment for the study, diagnosis, and treatment of dental diseases.

III. Plan of Management

General Consideration

The plan of management of the Department of Dentistry will vary in accordance with (a) the size of the hospital, (b) the type of the hospital, i.e., the type of medical service rendered by the hospital and, (c) whether or not it is feasible for the hospital to attempt, through its outpatient department, to give general dental care, particularly to patients who apply for such care without recognized systemic disease. Whereas, it is desirable that patients be afforded the opportunity of complete dental care, it does not seem possible for the average general hospital to assume the responsibility for the complete dental care of the community.

The hospital should envolve as rapidly as feasible a Department of Dentistry with adequate facilities to assume the responsibilities for complete dental care of certain types of inpatients and outpatients, and at the present time should extend dental care in that direction as rapidly as economic resources will permit. However, in health service, as in many other considerations, ideals must be tempered with practical realities; and careful study of fundamental problems forces the conclusion that in order to set up minimum standards of a plan of management that would be practical during the present transitional period, dental care under hospital auspices should be upon a selective basis and rendered in accordance with the following policy of oral-health service:

Classification of Dental Services for Hospital Patients

1. Care of the hospital patient in whom oral infection may be either an etiologic or an aggravating factor in systemic disease. Special consideration should be given to oral hygiene service before operation to all surgical patients except in emergency operations; oral hygiene service should also be given, on agreement with the directors of the medical services to other patients whose condition will permit.

2. Care of the ambulatory patient referred to the Department of Dentistry from other outpatient departments for consultation with regard to possible oral sepsis that may be related to systemic disease.

3. Emergency dental or surgical treatment of outpatients applying for relief of pain, acute infection, traumatic injury, or diagnosis. The most important services for patients classified in the above categories are oral diagnosis, surgical treatment (eradication) of acute or chronic periodontal and periapical disease, and treatment of traumatic injury.

4. Additional supplemental dental care may be instituted for the hospital patient, consistent with facilities and again upon a selective basis; (a) operative (reparative) dentistry should be made available for prenatal patients and hospitalized children and for tuberculous and chronic patients, and (b) prosthetic (reconstructive) dentistry should be made available for edentulous tuberculous patients or other chronic patients for whose care it may be considered necessary.

5. General dental care beyond the range indicated in No. 4 should be offered by certain types of hospitals and by general hospitals wherever feasible.

Where it is possible only to provide services of Classes 1, 2, and 3, and pending a time when Classes 4 and 5 may be added, the department may be known as the Department of Oral Surgery. A change of title (and of scope) to the Department of Dentistry is urged on all hospitals.

The material contained in this report, particularly the systematic plan of management, is based upon experience and observation in several municipal and voluntary hospitals in New York City. Most of this material has been drawn from a basic monograph on the oral surgical service as an integral part of modern hospital organization which should be consulted for details, and a full explanation of the various phases of the subject covered in this report.

The preceding paragraphs and the following outline are based upon the selective plan alluded to in previous paragraphs. An attempt has been made throughout to present a plan based upon minimum standards that are practical in every detail, and although special emphasis is placed on dental and oral surgery, because of present-day conditions, the plan includes provision for such other dental care as may be considered adequate during this transitional period and until hospitals may be able to render complete dental care inclusive of all branches of dentistry.

This plan of management is applicable to large general hospitals, hospitals for the tuberculous, and hospitals for chronic diseases. By modification, the plan of management may be adapted to smaller hospitals.

THE PLAN

Title of the Hospital Dental Service

The broad term of Department of Dentistry should be used if the service renders dental care in the various branches of dentistry including oral surgery. In larger hospitals where large departmental staffs are required the Department of Dentistry may be subdivided into Sections of Operative Dentistry, Prosthetic Dentistry, Periodontia, and Oral Surgery. However, when the service is confined only to oral surgery or when the work is essentially oral surgery with minimum provisions for supplemental dental care, and until additional dental services are added, the term Department of Oral Surgery may be used.

Staff Organization: The Attending Staff

The Department of Dentistry or the Department of Oral Surgery should (depending upon the plan of organization) be under the direction of a Director of Dentistry or Director of Oral Surgery, as the case may be. The Director should also hold the appointment of Visiting Dentist or

Visiting Oral Surgeon and be a fully qualified member of the Medical Board of the Hospital.

Qualifications for appointment to the Visiting Staff.—The Director of Dentistry should be required to have had adequate hospital or institutional experience and the Director of Oral Surgery, in addition to experience in hospital organization, should be qualified as a competent oral surgeon.

As far as possible the same qualifications should be required of the Associate and Assistant Dentist or Oral Surgeon. Qualifications should be made uniform and minimum standards should be those specified under Division II, paragraph 4; preliminary training, previous hospital experience, technical ability and aptitude to be given special consideration. Applicants with only one year's practice to their credit may be assigned to the outpatient dispensary and be required to serve provisionally for one year under supervision. Unless the candidate has special and unusual qualifications he should be recommended at the outset for Clinical Assistant Visiting Dentist or Oral Surgeon, with the above assignment.

Promotion in rank should be made as rapidly as may be consistent with ability and aptitude.

Size of staff required.—The number of appointments and grades in rank will depend upon the size and type of hospital.

Classification of appointments according to rank.—The uniform use of standard nomenclature of staff appointment is recommended in accordance with the following classifications:

Director of Dentistry or Oral Surgery (who shall also hold the rank of Visiting Dentist or Oral Surgeon).
Visiting Dentist or Oral Surgeon.
Associate Visiting Dentist or Oral Surgeon.
Assistant Visiting Dentist or Oral Surgeon.
Clinical Assistant Visiting Dentist or Oral Surgeon.
Resident Dentist or Oral Surgeon.
Dental or Oral Surgical Intern.
Dental Hygienist (where legalized).

Staff members with the rank of Associate Visiting Dentist or Oral Surgeon may be qualified as chiefs of the inpatient and outpatient clinics.

Clinical Assistant Visiting Dentists or Oral Surgeons should be assigned to the Outpatient Clinic. After gaining reasonable experience and at the discretion of the Director of the Service, they may be assigned to the Inpatient Clinics and ward service.

The staff in a hospital with 150-200 beds, with an active outpatient dispensary should consist of a Director of Dentistry or Oral Surgery, three associates or assistants, one dental or oral surgical intern, and one dental hygienist. In larger hospitals the staff should be proportionately larger.

Resident and Intern Staff

General considerations.—Provision for dental or oral surgical interns should be one of the requirements of approved hospitals operating a Department of Dentistry or a Department of Oral Surgery.

Interns are eligible only if qualified by the statutory requirements of the State Law.

Appointment should be made according to the regulations of the hospital to which application is made.

Opportunity should be provided for specialized training, and clinical research should be encouraged, under a systematized plan, in accordance with existing facilities.

Special effort should be directed toward adequate training of the intern in the administration of general anesthetics and in clinical experience of physical diagnosis related to dental problems.

An organization of ex-interns should be encouraged and developed, with alumni meetings held at least once a year.

Length of Intern Service.—It is recommended that appointments be made for a one-year period. If appointment is to be continued, it may carry advancement to grade of Resident Dentist or Oral Surgeon.

Number of Interns.—The number of interns should be proportioned according to the Hospital Census and annual visits to outpatient department. A reasonable minimum standard requirement in a hospital census of 1,000 patients and for outpatient dispensary service with dental patients numbering 10,000 to 15,000 patient visits annually might be three interns and one resident. Attention is called to the fact that these figures are applicable where essentially an oral surgical service is maintained. As stated in Section III, Plan of Management, the goal of dentistry is that "the hospital should evolve as rapidly as feasible a Department of Dentistry with adequate facilities to assume the responsibilities for complete dental care for certain type of inpatients and outpatients." If and when such general dental care is provided for the hospital patient, it will be necessary to increase the proportion of dental interns and residents.

Residents (second year interns).—The staff should approve a resident when a service has three or more interns. A standard salary should be paid commensurate with the salary of residents on other major services.

Dental Hygienists

Basis for appointment of Dental Hygienists.—In hospitals having 100 beds or more a dental hygienist or hygienists should be employed, if recognized by the State Law. Their function is to give routine oral prophylactic service as directed by the Head of the Dental Service in agreement with the directors of the various medical services.

Scope of Oral Prophylactic Service.—This service should be given in both the Inpatient and Outpatient Clinics with special emphasis on the following: Preoperative surgical patients, particularly those to have general anesthesia; prenatal and medical cases should have oral prophylactic service with follow-up during convalescence according to the length of such convalescence.

Equipment

Minimum requirements of equipment.—The volume of dental service required will vary with (a) the size of the hospital (the total number of beds, the number of beds devoted to ward or free service and the size of the Outpatient Dispensary), (b) the type of the hospital and (c) local conditions. The number of dental chairs with accompanying equipment will vary similarly. The minimum requirement of a 200 bed hospital with 25,000 annual outpatient visits, should be two dental chairs with adequate auxiliary equipment including dental x-ray apparatus and dark room facilities.

The physical equipment should be utilized full time daily, and the personnel of the staff should be adequate to maintain this standard.

Minimum Requirement of Management

General considerations.—All patients' teeth and mouths should be examined by a member of the dental staff as soon after admission as their condition permits. The mouth conditions should be recorded on a special form with appropriate recommendations, and this record should become a part of the official hospital record of the patient.

The dental or oral surgical service should function in both outpatient and inpatient ward service, in accordance with the minimum standards and selective plan alluded to in this report.

Ward Rounds.—Departmental ward rounds are essential to a systematic plan of management and should be regularly scheduled.

Management of the Oral Surgical Service.—The work of the Department of Oral Surgery in relation to the hospital outpatient, and inpatient ward service may be designated as (a) diagnosis and (b) prophylactic and surgical treatment. "Diagnosis" includes clinical diagnosis of diseases of the mouth; also clinical and roentgenologic diagnosis of oral focal infection, with special reference to the relation of oral sepsis to systemic disease. Treatment should consist of oral hygiene procedure, particularly routine oral prophylaxis for the preoperative surgical patient, and surgical eradication of chronic oral infections suspected of being related to systemic disease. Experience in many hospitals has indicated that it is both feasible and desirable from the standpoint of the patient's interests that the oral surgical service should, in addition to the above, care for surgical diseases and injuries of the teeth and jaws such as acute infections of dental origin, cysts and inflammations of the jaws, osteomyelitis and necrosis of the jaws, traumatic injuries and complicating infections of the teeth and jaws, and certain benign neoplasms and malformations of the jaws. Transfer or assignment of such services to the oral surgical service will depend on the competence and availability of oral surgeons to care for those conditions, and will, of course, be with the consent of the medical board.

Where competent oral surgical service is available the following systematic plan of management is recommended for standard procedure in relation to special oral surgical conditions:

(a) That tumors of the mandible and jaw should be admitted to the surgical ward and assigned to the Oral Surgical Service for treatment, or for consultation with the Tumor Service as conditions indicate.

(b) That fractures of the jaw, osteomyelitis of the jaw, etc., requiring operative treatment, whether by intraoral or extraoral approach, shall be admitted to the surgical ward and assigned to the Oral Surgical Service for treatment.

(c) That patients suffering from surgical complications of dental origin, requiring extraoral incision shall be admitted to the surgical ward and assigned to the Oral Surgical Service for treatment. At the discretion of the Oral Surgeon in charge, consultation shall be had with the surgical service to which the patient may, if acceptable, be referred for treatment, and that such treatment be instituted by the cooperation of the two named services.

(d) That patients suffering from surgical complications of dental origin amenable to intraoral treatment, operative or otherwise, shall be admitted to the surgical ward and assigned to the Oral Surgical Service.

(e) That whenever a patient is admitted to any service from the Oral Surgical outpatient dispensary, a request for consultation shall be simultaneously sent to the Visiting Oral Surgeon in order to facilitate prompt cooperation in the care of the patient.

In large hospitals sufficient and adequate bed service should be assigned specifically to the Department of Oral Surgery.

Interdepartmental Relations.—Special effort should be directed toward close interdepartmental cooperation, particularly between the Department of Dentistry or the Department of Oral Surgery and the Department of Surgery, Medicine, Obstetrics (prenatal), Pediatrics, and Otolaryngology.

Relation to the Hospital School of Nursing.—Lectures on oral pathology and oral hygiene should be given to student nurses in hospitals

having a training school for nursing. Five hours of teaching with thirty hours of clinical observation are suggested as minimum requirements. Instruction should include actual clinical experience in rendering adequate care of the patients' mouths.

Staff Meetings and Clinical Conferences.—Staff meetings and in addition clinical conferences should be held each month.

Research.—Clinical research should be encouraged and adequate facilities should be made available.

Rules and Regulations.—Rules and regulations are essential to efficient management. There should be a standard set of departmental rules and regulations and also rules and regulations for the intern staff.

Records.—A carefully planned system of adequate records is essential in the management of the oral surgical service, and a uniform method of recording data should be established for departmental use. The routine records, and the method of filing them, should be simple and practical for future reference. Special clinical records, carefully filed in accordance with an appropriate plan of classification and cross-indexing, are a valuable adjunct to clinical research.

Formulary.—A standardized departmental formulary, based upon "Accepted Dental Remedies" of the Council on Dental Therapeutics of the American Dental Association should be adopted and should be included in the general formulary of the hospital.

Books and Journals in the Hospital Library.—Hospital libraries should include books on dentistry, oral pathology and oral surgery and selected journals approved by the American College of Dentists, and the American Dental Association.

The readers of the JOURNAL, it was thought, should be interested in this development that not only affects oral surgery, but also the practice of dentistry in hospitals. This is indeed an important step forward. The practice of oral surgery has been developed in most hospitals to various degrees of efficiency and the leaders in the profession agree today that many oral surgical procedures require hospitalization. The practice of doing extensive surgical operations in an office, with general or local anesthesia, is rapidly being discarded, because proper premedication, controlled chemotherapy, many intricate diagnostic and preoperative procedures cannot be offered to ambulatory patients with safety, nor can patients operated on in an office receive proper postoperative and postanesthetic care, which may require bed rest that cannot be terminated when the clock strikes 5:00 P.M. Medication for the control of severe pain and restlessness, treatment of dehydration and shock, and good nursing are other procedures which are better given in a hospital than in a home. Likewise, many oral surgical diseases cannot, and should not, be treated in an outpatient department of a hospital, but should be admitted to the inpatient department to be taken care of by the members of the oral surgical service appointed to the house staff.

The problem of rendering service to hospitalized patients in other fields of dentistry presents many difficulties. There is no question, for example, that patients who have teeth removed because of medicodental problems, or who have their masticating ability disturbed by oral surgical operations should not be discharged without having the resulting defect repaired by restorative dentistry. In many hospitals such patients are referred to another institution for such work, as for example, to a dental school clinic. This, however, is not

always a satisfactory plan for the patient, and certainly not as good a teaching procedure as when both the dental and medical intern can see the final result of the dentist's work, not to speak of its effect on the patient's general health.

The problem of getting dentists to give up some of their time to serve on a hospital staff, even when being offered an honorarium, is quite difficult. Unlike the physician, or surgeon, who receives only a basic training in the medical school, the dentist in the past has been given training as a student which fits him to go directly into general practice without needing an internship. Internships, therefore, attract the dental graduate only if he can profit by the experience. Oral surgery is a field in which the dental student gets only basic training in the dental school, and therefore he is quite willing to spend a year as an intern in the oral or dental surgery department of a hospital. In order to make an internship in general dentistry attractive, the hospital would have to offer an inducement such as experience in physical diagnosis, observation of the relation of dental infection to somatic diseases, and an opportunity to participate in clinical investigation in dentomedical fields.

Another solution is that which the Harvard School of Dental Medicine has adopted as part of its latest modified plan for correlating the knowledge of dentistry and medicine. This is to the effect that after having been taught the fundamentals of clinical dentistry the dental student in the last year will get the final training in a well-equipped hospital clinic. If, in the hospital, instruction in diagnosis and the art of treatment is given with the same careful supervision as in the dental school, by competent instructors, it should do a great deal to bring about closer cooperation and better understanding between medicine and dentistry. It should give the dental student experience in problems affecting the entire organism, and help to demonstrate to the medical men some of the problems of restorative dentistry.

K. H. T.

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